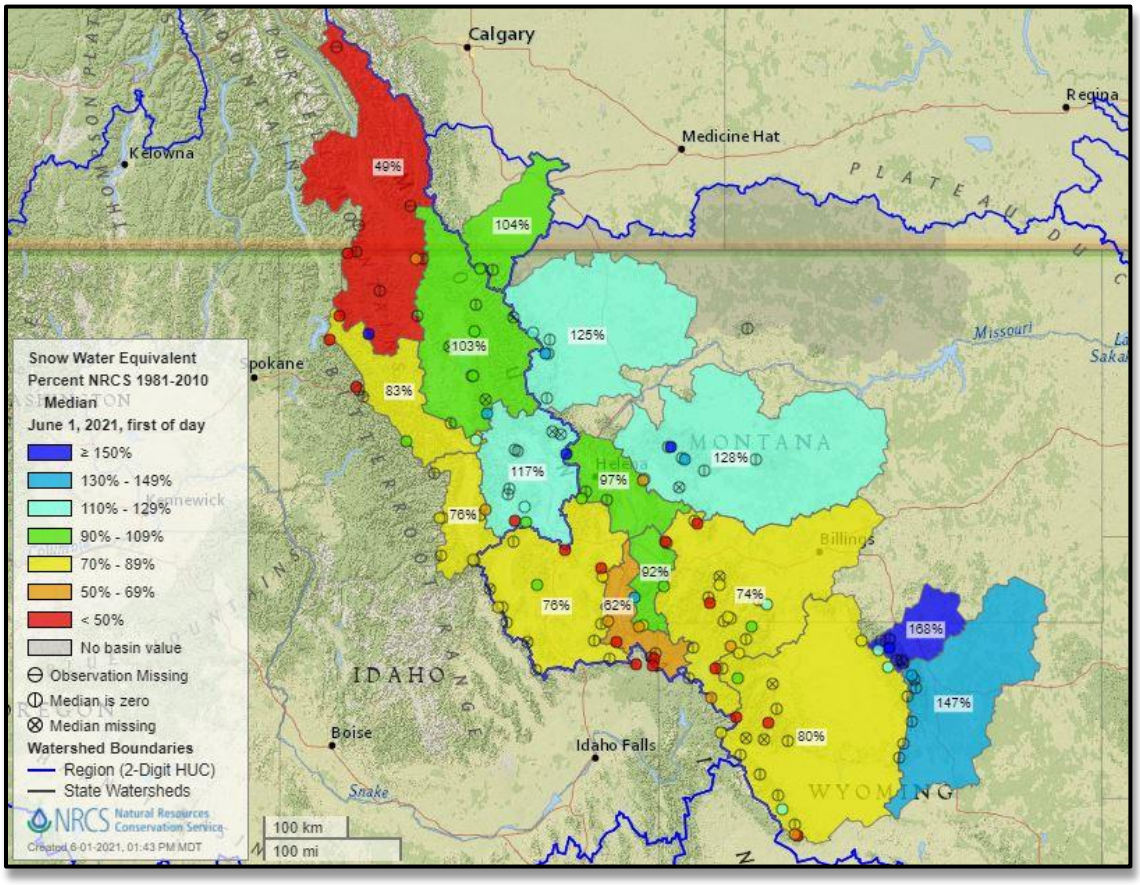
NRCS Natural Resources Conservation Service

USDA

Montana
Water Supply Outlook Report
June 1st, 2021



Spring in Montana is notorious for its wild weather, and May did not disappoint. With swings from 80-degree temperatures to 6” of snow in the valleys, some basins were favored with ample precipitation while others experienced small gains. Much of the low elevation snow melted off in April, while high mountain reserves were prolonged in certain drainages by winter storms in mid-May. The Rocky Mountain Front received almost 4” of snow water equivalent and several feet of snow depth while the same system hit the Kootenai River Basin with rain at 6500 ft, eating away at high mountain snowpack.

As rivers begin to swell with snowmelt in earnest, streamflow forecasts range greatly across the state. Drought conditions may persist in the southwest on the Red Rock River while we may see flood stages on the Dearborn River and Badger Creek across the front range. Readers can find more information on their specific basin of interest in the following report.

For more water supply and resource management information, contact:

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10 East Babcock, Room 443
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http://www.nrcs.usda.gov/wps/portal/nrcs/main/mt/snow/

NRCS Snow Survey – Operational News

May is a transitional month for the Montana Data Collection Office (MTDCO) as far as operations are concerned. The focus shifts from collecting and editing data, writing reports, and measuring snow courses to **SNOTEL maintenance**. Each summer season (May – September) snow survey staff visit every SNOTEL site in our region (a total of 138 automated weather stations) to check electronics and perform any needed maintenance, ensuring the stations are ready to report good data throughout the coming winter.

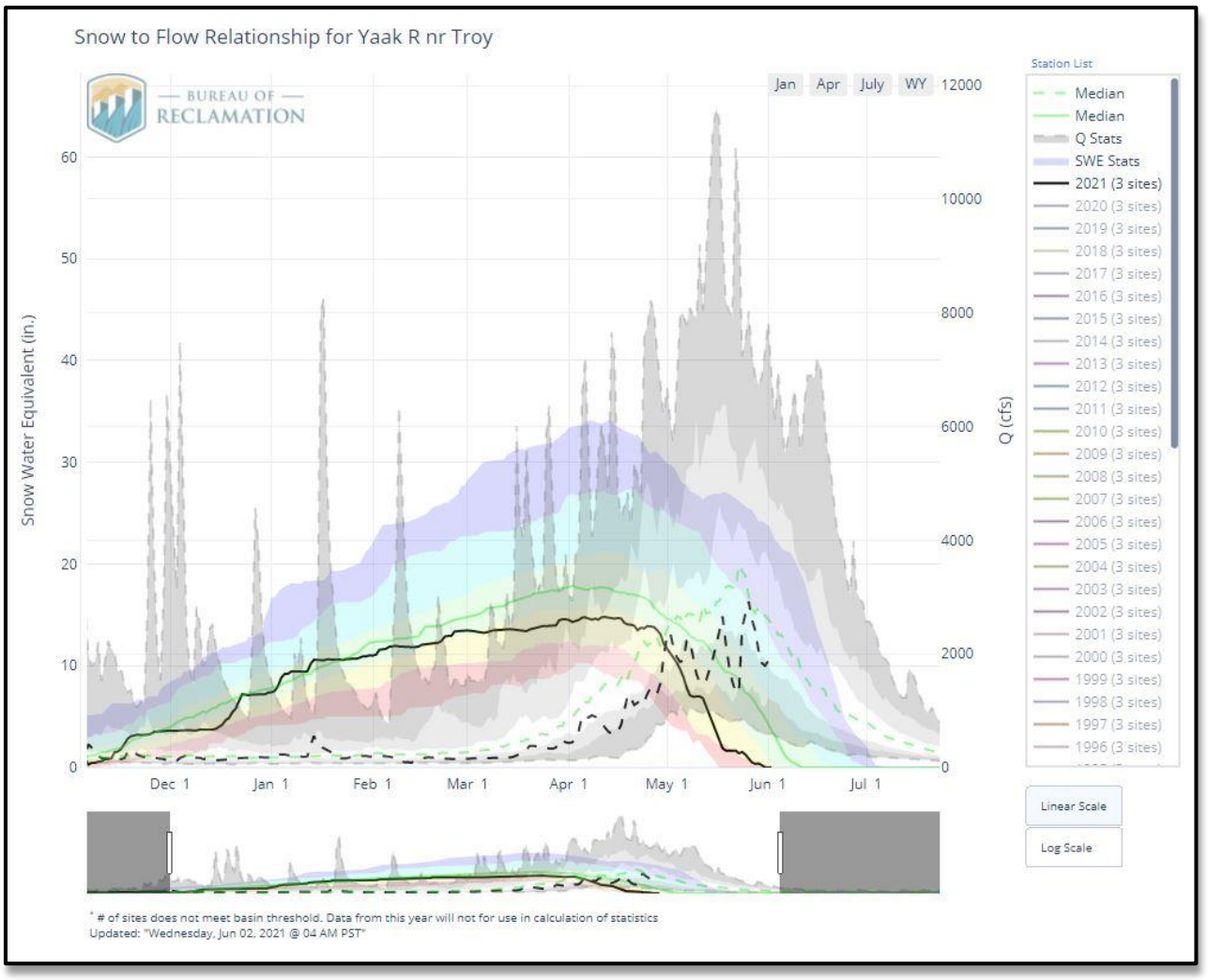
To prepare for this endeavor requires extensive planning; preparing a schedule outlining where each crew will be each week, purchasing necessary equipment and supplies, and coordinating with our partners and snow survey staff in neighboring states. Then in mid-May, crews begin to travel all over Montana, Wyoming and South Dakota and the summer maintenance season begins!

During the last 2 weeks in May, MTDCO staff traveled to South Dakota to repair the snow pillow at the North Rapid Creek SNOTEL site, visited the Rocky Boy SNOTEL site in the Bears Paw Mountains and made a trip to Missoula to maintain lower elevation stations in the area. Things are off to a good start!

Speaking of transitions, an invaluable member of the MTDCO team has recently "departed" to take a new position with NRCS. Water Supply Specialist, Lucas Zukiewicz, has transitioned to his new role with the National Water and Climate Center as of May 24, 2021. Lucas has been an integral part of MTDCO operations for over 13 years. He will be sorely missed but thankfully his new position keeps him located in Bozeman, allowing him to remain involved with MTDCO activities

Lucas Zukiewicz, former Water Supply Specialist for Montana DCO, giving the sayonara wave after his last snow survey as part of the MTDCO staff. Photo taken leaving the Elk Peak snow course after measuring the course at the end of April 2021.

NRCS Snow Survey – Product Highlights



Daily River Basin Conditions:

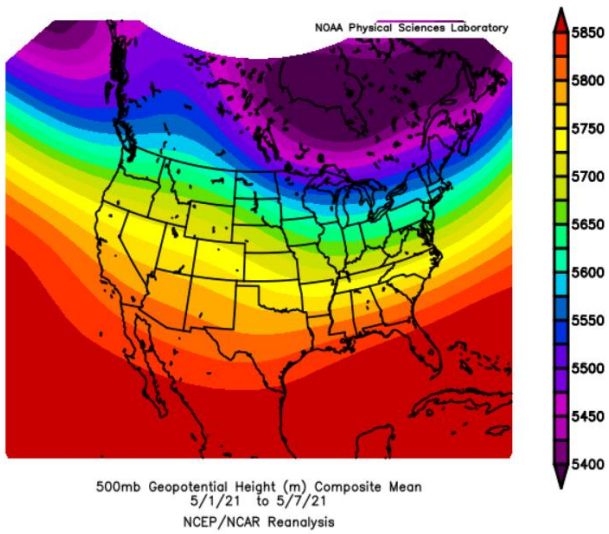
On the USDA NRCS Montana Snow Survey Homepage, many products are available to decipher future water supply, current snowpack, and precipitation parameters. The data can be sliced several ways over various time periods. One can look at it traditionally in the month to month format much like the *Water Supply Outlook Report* or see how individual storms have affected basin totals for mid-month updates. Snow water equivalent and precipitation (including peaks and percent of normal), temperature anomalies, and streamflow discharge are all available and updated daily in the *Daily River Basin Summary*.

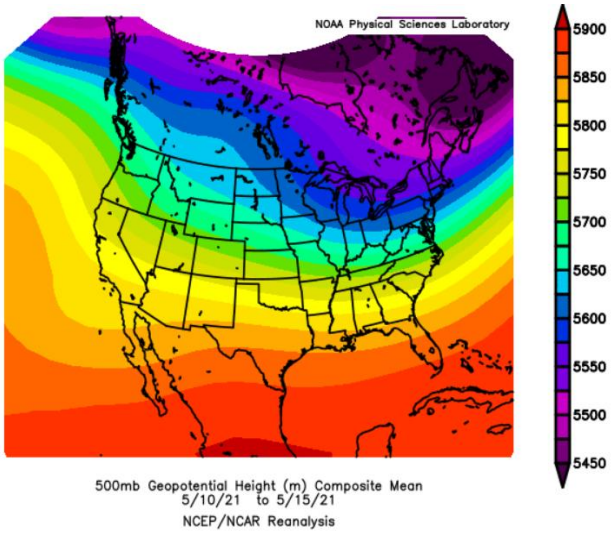
Particularly in springtime, *Snow to Flow* relationships, a product developed by the US Bureau of Reclamation, can be quite interesting to look at daily. They provide information about how quickly snowpack is melting and its contribution to peak flows. A rapidly melting snowpack may cause flooding, but also can flow past water users before they get a chance to utilize it for irrigation, while a slow, steady melt can prolong the runoff season, stretching supplies. Recreationists such as rafters and kayakers will also find this tool particularly helpful in timing peak flows on their river of choice. For example, the Yaak River (graphed above) reached its snow water runoff peak in late May with the help of a rain on snow event.

Monthly Weather: Weather and Climate

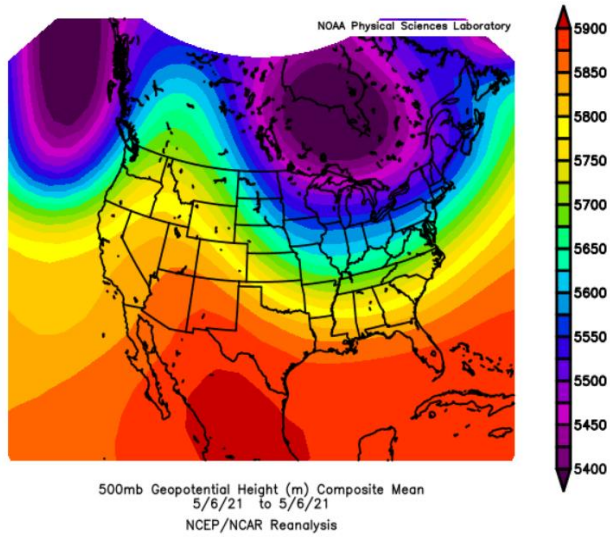
Circulation Patterns

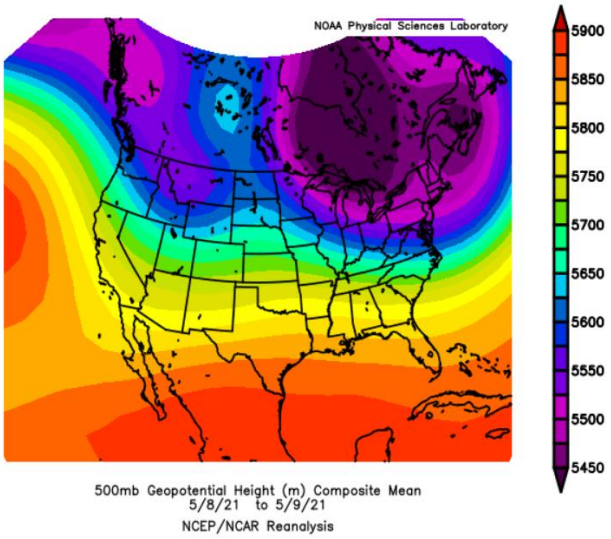
The first two weeks of May were mostly characterized by westerly flow, with some rapid circulation shifts between May 6 and May 9. The plots below show jet stream-level flow coming broadly from the west for most of that period, which translated to near-average temperatures and little appreciable precipitation in Montana and Wyoming basins.



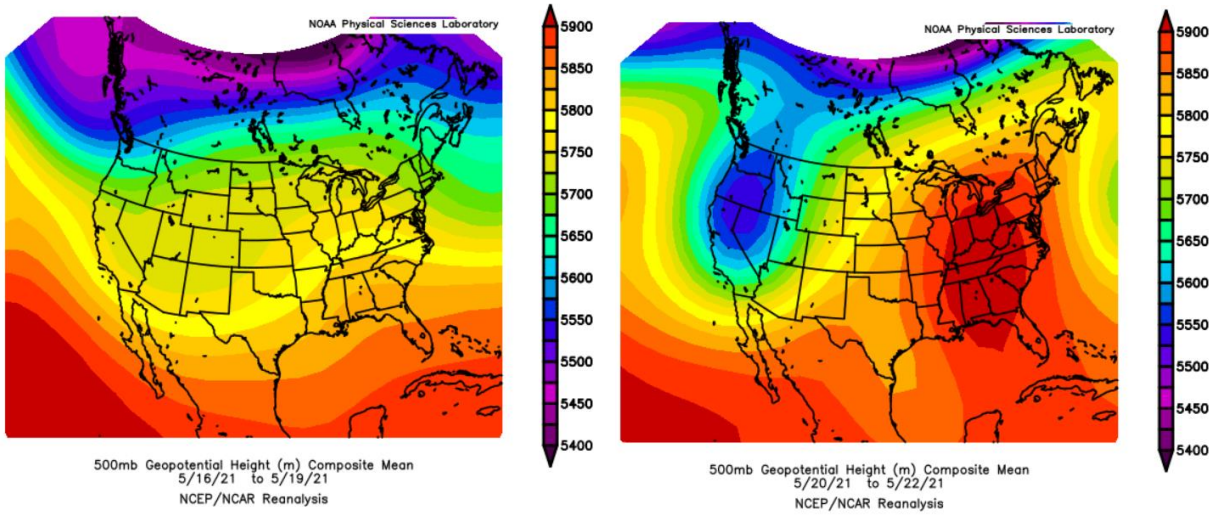


Circulation patterns shifted on May 6-7 to a more southwesterly flow (below left), which delivered above average temperatures across all basins. This was followed by another quick shift to a low-pressure system that dipped into Montana on May 8-9 (below right), bringing cold air and moisture in the form of snow to ranges along the Rocky Mountain front. A handful of SNOTEL stations in the Flathead and Smith-Judith-Musselshell basins picked up around a foot of snow and 1.5” of SWE, but most stations across the region recorded half of that or less, and the circulation pattern quickly returned to westerly flow until the middle of the month.





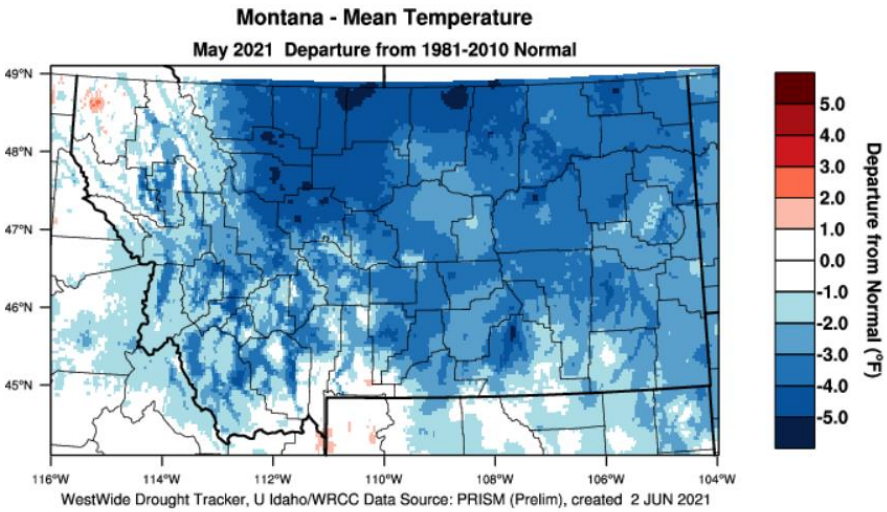
The second half of May brought several dramatic shifts in circulation that translated to wild swings in weather. From May 16-19, flow shifted to southwesterly (below left), which transferred warm air from the southwestern US to the region, and as a result temperatures were well above normal for that period and snowpacks at all but the highest elevations continued to melt. This shifted dramatically on May 20 when a cutoff low dipped into the western US (below right), mixing cooler temperatures with moisture from the Gulf of California and depositing up to several inches of SWE in the form of snow at most mountain elevations. All basins received precipitation, and the largest SWE increases were in the Madison, Gallatin, Jefferson, and Sun-Teton-Marias basins.



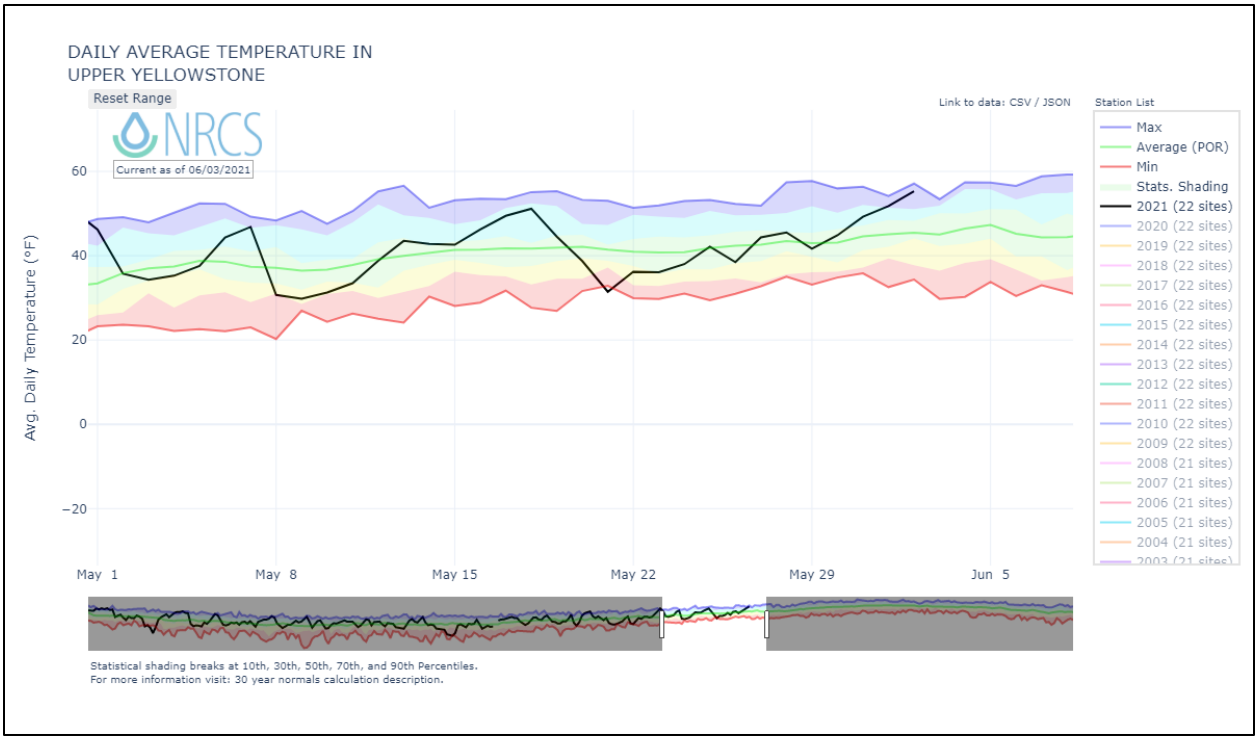
The last week of May returned to westerly flow, with temperatures near average but slowly rising into a hot welcome to June.

Air Temperatures

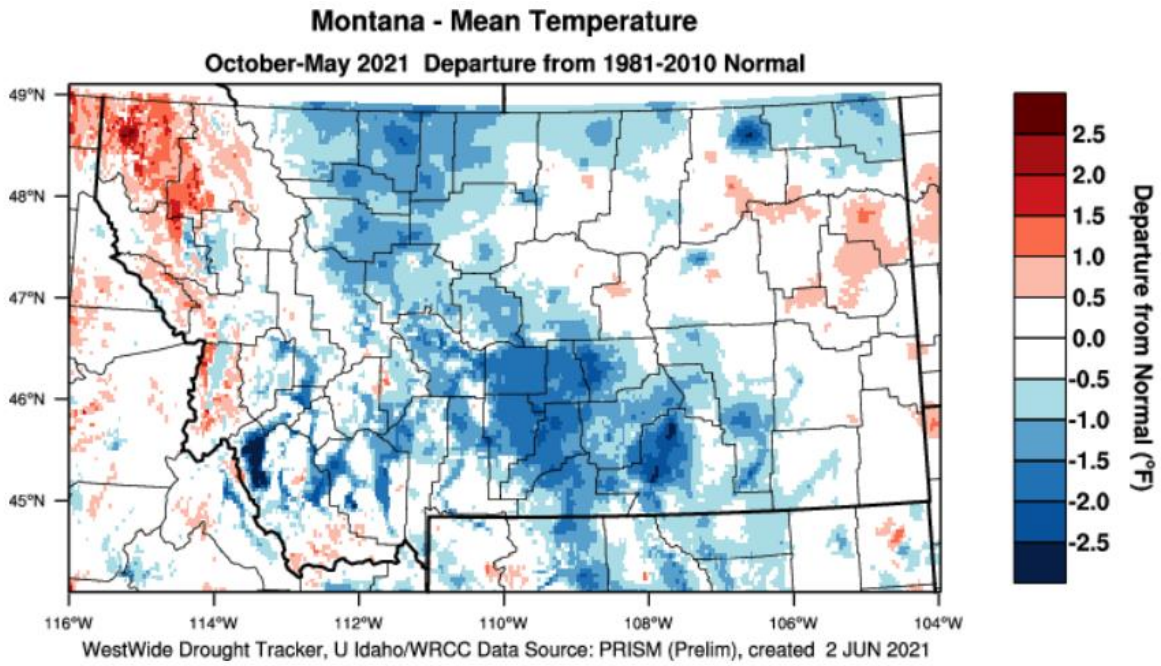
Overall, the month of May saw slightly below average temperatures across the region and ended up looking similar to April temperature patterns. The brief warm periods in May were moderated by cooler periods and long stretches of roughly average temperatures. The only minor exception was the far northwest corner of Montana in the Kootenai, which had close to average temperatures and a small region with slightly higher than average temperatures.



Below is a plot of average temperatures from 21 SNOTEL sites in the Upper Yellowstone basin for the month of May, which shows the swings between above and below average and gives a sense of how it evened out to be slightly below average for the month.



Average temperatures for Water Year 2021 (since October 1, 2020) look largely similar to how they did last month: mixed, with central Montana slightly below average and pockets of the state in the northwest and far eastern corners slightly above average.



Snowpack – Overview

As we transition into hot June weather, rivers are rapidly rising from snowmelt. As of June 1st, 82 of the 138 SNOTEL sites in Montana and its surrounding watersheds are melted out, with snowpack only remaining at upper elevations. In general, 60-80% of this year's peak snowpack remains at the highest elevations. Percentages are slightly lower in locations west of the continental divide, which is typical. **Figure 1** shows the percentage of remaining snowpack at several of the higher elevation SNOTEL sites for selected Mountain Ranges across Montana.

SNOTEL Site	Mountain Range	Elevation_ft	June 1 SWE	2021 Peak SWE	% SWE Remaining
Brackett Creek	Bridger	7320	0	16.1	0%
Crystal Lake	Big Snowy	6050	0	13.5	0%
Poorman Creek	Cabinet	5100	5.4	30.8	18%
Boulder Mountain	Big Belt	7950	4.7	20.3	23%
Monument Peak	Beartooth	8850	7.1	22.5	32%
Twin Lakes	Bitterroot	6400	13.9	41.3	34%
Stahl Peak	Whitefish	6030	14.6	28.5	51%
White Mill	Beartooth	8700	13.5	26	52%
Mule Creek	Pioneer	8300	10.1	15.8	64%
Noisy Basin	Swan	6040	27.2	41.2	66%
Shower Falls	Gallatin	8100	17.8	26.3	68%
Flattop Mtn.	Livingston (GNP)	6300	33.7	48.2	70%
Darkhorse Lake	Beaverhead	8945	21.4	29.5	73%
Carrot Basin	Madison	9000	19.9	25.8	77%
Fisher Creek	Beartooth	9100	25.1	31.5	80%
Moss Peak	Mission	6780	29.3	36.1	81%
Spur Park	Little Belt	8100	20.4	24.2	84%

Figure 1: Percent Snow Water Equivalent remaining at high elevation SNOTEL sites in Montana as of June 1, 2021.

In terms of timing, the mountain snowmelt that started in early April continued into May but was slowed by a couple weeks of winter like weather mid-month. As of May 1st, much of the upper elevation snowpack was not significantly contributing to streamflow, but as of June 1st all remaining snow is melting fast as can be seen in local rivers, like the Gallatin River in **Photo 1**.

Photo 1: Gallatin River – 6/3/2021

SNOTEL sites across the region peaked slightly early and below average this year. Exceptions are portions of the Upper Clark Fork, Upper Bitterroot, and Bighorns, which saw near to slightly above average snowpack peaks. Unfortunately, the below average snowpack peaks across most of the state will likely result in reduced streamflow volumes this summer.

Currently, snowpack percentages are up in many basins from last month, see **Figure 2** on the following page. This is due to beneficial precipitation and slowed melt during the cooler weather in May. **It's important to note** that snowpack percentages can be deceiving this time of the year. For example, on May 1st the Owl River Basin had 4.9 inches of snow water equi (12 inches depth). The 30-year median is 1.0 inches of water. A 490% change seems alarming, but just means 12 inches of snow melted in the month of May.

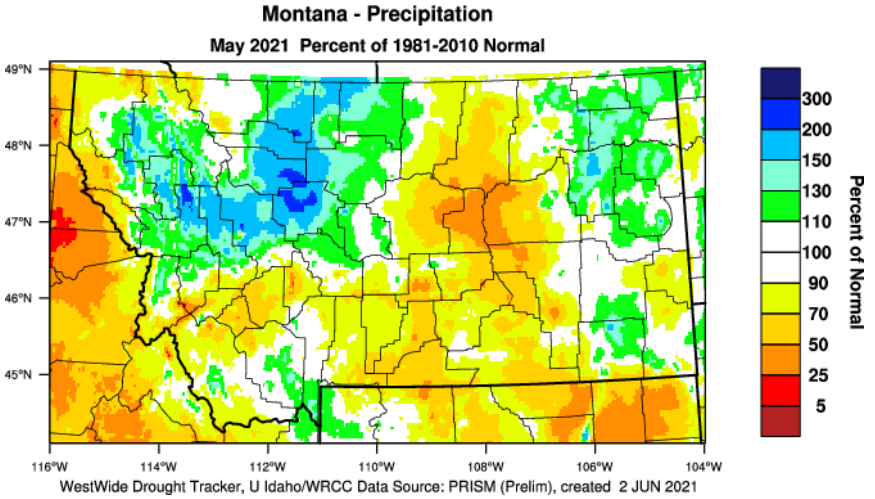
Basin-wide Snow Water Equivalent –Percentage of Normal and Monthly Change

River Basin Name	May 1 SWE % norma	June 1 SWE % normal	SWE % Chang
Owl	490%		-490%
Little Bitterroot	128%		-128%
Greybull-Wood	114%	0%	-114%
Fisher	91%		-91%
Yaak	89%	2%	-87%
Shields	82%	14%	-68%
Boulder (Yellowstone)	107%	58%	-49%
Madison ab Hebgen	74%	37%	-37%
Rock (Clark Fork)	92%	55%	-37%
Stillwater (Yellowstone)	99%	74%	-25%
Kootenai in Montana	84%	60%	-24%
Wind	104%	80%	-24%
Big Horn	121%	100%	-21%
St. Marys	120%	104%	-16%
Bitterroot	90%	76%	-14%
Yellowstone ab Livingston	86%	72%	-14%
Clarks Fork Yellowstone	97%	84%	-13%
Northern Gallatin	101%	89%	-12%
Lower Clark Fork	90%	83%	-7%
Madison bw Hebgen	81%	74%	-7%
Ruby	78%	71%	-7%
Kootenai in Canada	88%	82%	-6%
Rock (Yellowstone)	106%	104%	-2%
Shoshone	69%	68%	-1%
Bear Paw			+0%
Helena Valley	96%	97%	+1%
North Fork Flathead	91%	94%	+3%
Big Hole	84%	88%	+4%
South Fork Flathead	91%	95%	+4%
Beaverhead	74%	79%	+5%
Gallatin ab Gateway	92%	97%	+5%
Boulder (Jefferson)	88%	98%	+10%
Flathead Lake	89%	99%	+10%
Powder	137%	147%	+10%
Flint	95%	107%	+12%
Middle Fork Flathead	97%	109%	+12%
Marias	103%	119%	+16%
Swan	92%	109%	+17%
Upper Clark	90%	109%	+19%
Smith	93%	116%	+23%
Stillwater (Flathead)	89%	113%	+24%
Southern Flathead	92%	124%	+32%
Blackfoot	102%	138%	+36%
Sun	110%	149%	+39%
Teton	109%	149%	+40%
Tongue	118%	168%	+50%
Judith	99%	168%	+69%
Musselshell	99%	168%	+69%

Figure 2

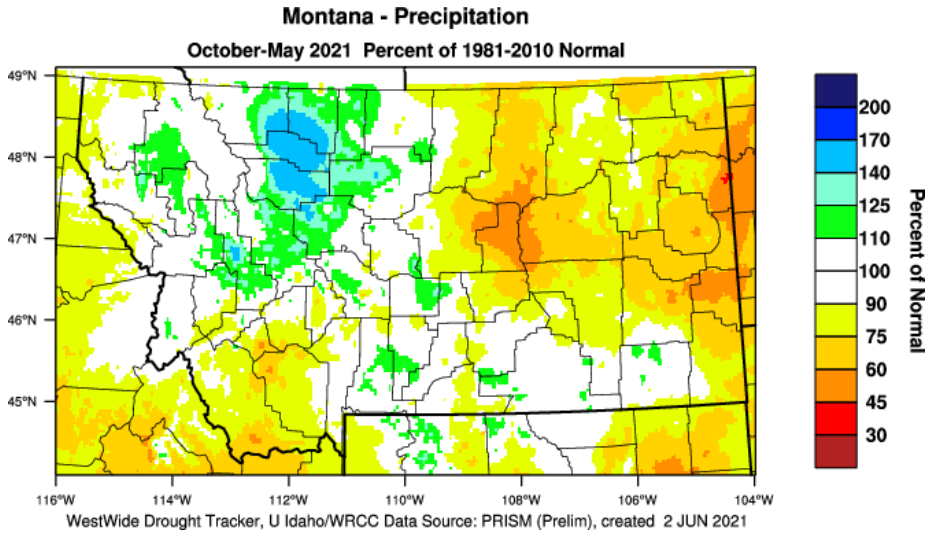
Precipitation – Overview

Following a relatively dry start to this spring, cool weather and precipitation was welcomed across much of Montana during the month of May. May did start with warm dry conditions that continued the snowmelt which began in early April. In general, May precipitation was near to above average across Montana. Exceptions were central Montana and central to northeast Wyoming.



The bulk of May precipitation came in two storms. The first arrived on May 6th and favored the southern Mission, Little Belt, North Gallatin, and Tobacco Root Mountains. This storm brought snow to upper mountain elevations and rain elsewhere. 3-day storm totals ranged from 5+ inches of new snow in the Little Belts and Tobacco Roots to 11+ inches in the Mission and Swan ranges. The later and larger storm arrived around May 19th. This storm brought winter-like conditions at all elevations. 3-day storm totals ranged from 5+ inches of new snow in southwest Montana to 15+ inches on the Front Range. This storm also brought more precipitation to the Mission Mountains, where North Fork Jocko SNOTEL received 9 inches of mixed precipitation (rain/snow) from May 19th to 28th. Average (1981-2010) May precipitation at NF Jocko is 4.61 inches.

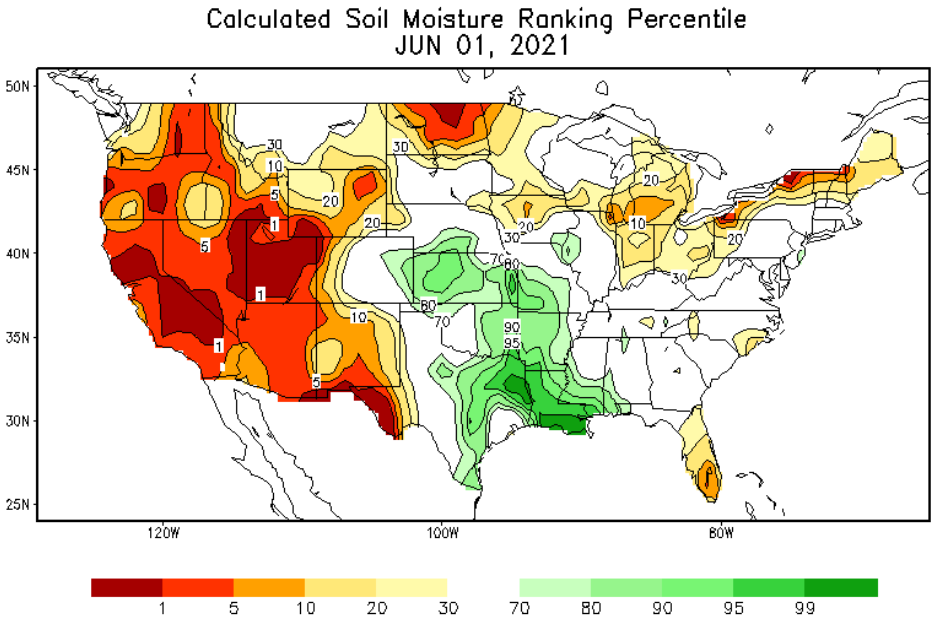
While water year precipitation continues to be below average in many parts of the state, May certainly helped. Looking back to February, nearly all basins were at near to above average precipitation for the water year. March and April lacked precipitation. Many SNOTEL sites received more precipitation in May than both March and April combined. June is typically one of the last "wet" months in the region before the typical summer weather pattern begins, resulting in less widespread precipitation events.



Soil Moisture

Modeled Soil Moisture, shown to the right, for June 1, 2021, indicates that soils are in the lower percentiles regarding moisture content for this date in many areas of the state. The largest deficits in soil moisture can be found in the eastern and southwestern regions of the state.

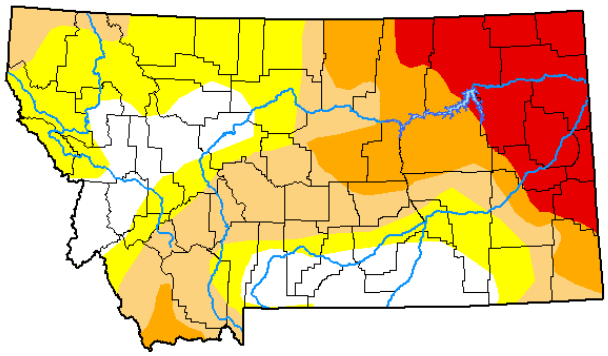
Soil moisture deficits could impact surface water runoff from snowmelt, especially in the southwest basins.



Drought

The most recent National Drought Monitor map, released on June 4, 2021, shows 82% of the state of Montana in some category of drought designation.

This is a slight improvement from last month's status which had 88% of the state categorized as D0 – D4 as shown in the map below from May 4, 2021.



U.S. Drought Monitor

Montana

June 1, 2021

(Released Thursday, Jun. 3, 2021)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	18.10	81.90	54.23	30.69	15.56	0.00
Last Week 05-25-2021	14.48	85.52	60.47	30.69	15.56	0.00
3 Months Ago 03-02-2021	15.31	84.69	61.18	10.56	0.00	0.00
Start of Calendar Year 12-29-2020	36.37	63.63	34.41	8.27	0.36	0.00
Start of Water Year 09-29-2020	11.86	88.14	40.59	4.22	0.02	0.00
One Year Ago 06-02-2020	57.83	42.17	5.45	0.00	0.00	0.00

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:

Brian Fuchs

National Drought Mitigation Center

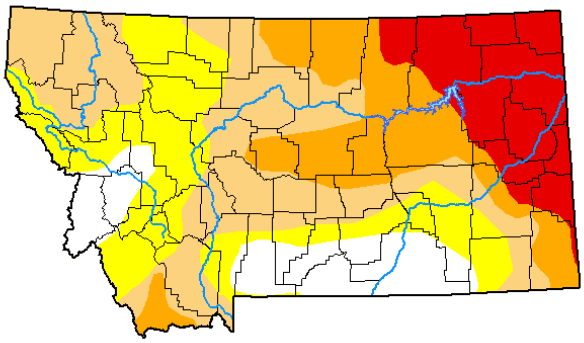
droughtmonitor.unl.edu

The third week in May brought much needed moisture, in the form of snow and rain which led to improvements in drought categories for many counties.

The Drought Monitor Class Change map below shows the regions in northwest and central Montana that have improved drought desigantions over the past month as well as the degradation in drought designation in southwest Montana.

U.S. Drought Monitor

Montana



May 4, 2021

(Released Thursday, May. 6, 2021)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	12.37	87.63	64.36	33.97	15.71	0.00
Last Week 04-27-2021	10.94	89.06	63.46	31.37	14.25	0.00
3 Months Ago 02-02-2021	3.34	96.66	56.54	16.21	0.36	0.00
Start of Calendar Year 12-29-2020	36.37	63.63	34.41	8.27	0.36	0.00
Start of Water Year 09-29-2020	11.86	88.14	40.59	4.22	0.02	0.00
One Year Ago 05-05-2020	70.55	29.45	0.82	0.00	0.00	0.00

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:

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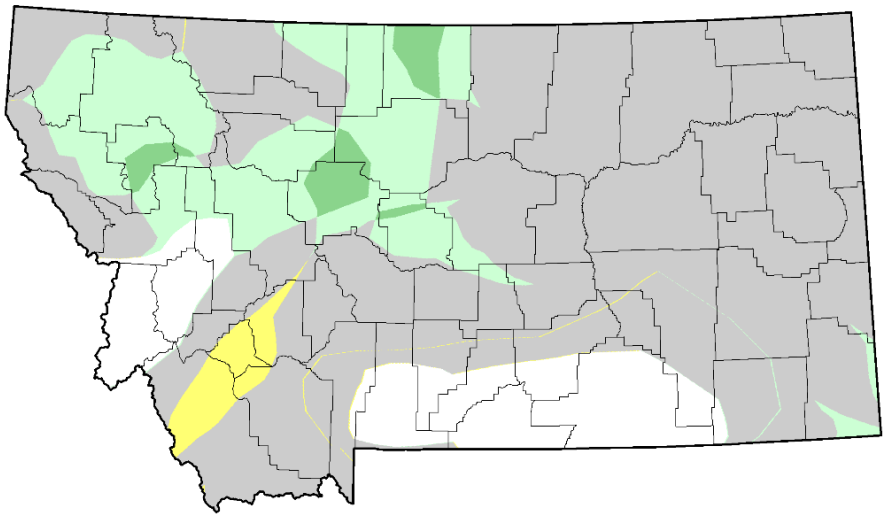
U.S. Drought Monitor Class Change - Montana

4 Week

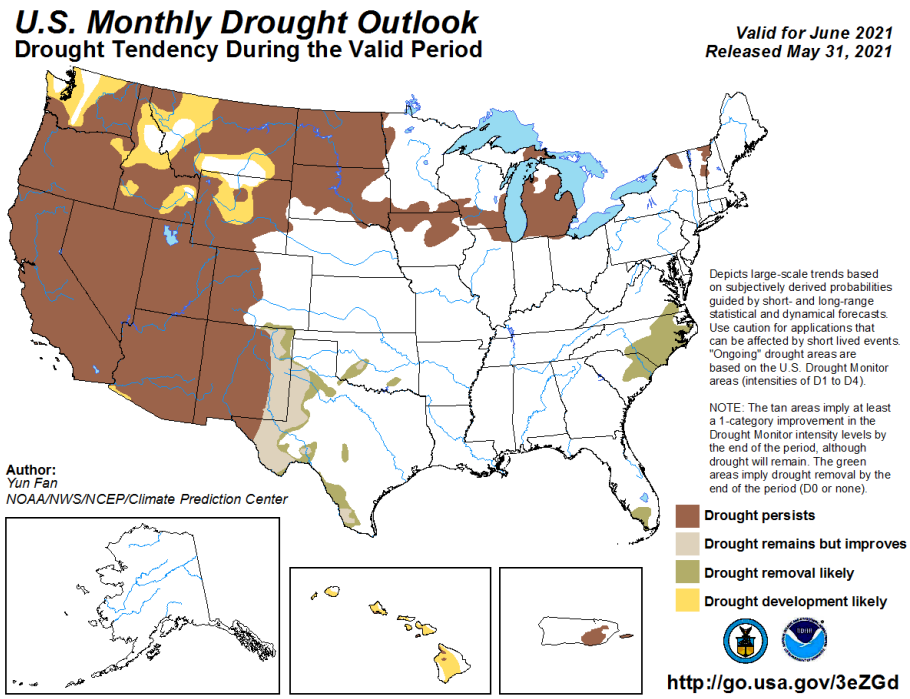


June 1, 2021 compared to May 4, 2021

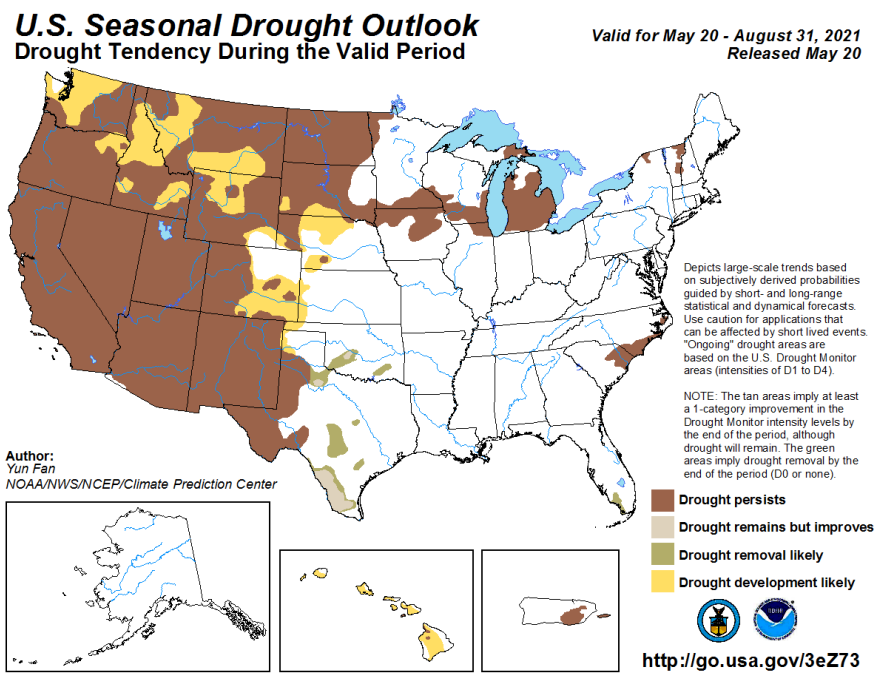
droughtmonitor.unl.edu

- 5 Class Degradation
- 4 Class Degradation
- 3 Class Degradation
- 2 Class Degradation
- 1 Class Degradation
- No Change
- 1 Class Improvement
- 2 Class Improvement
- 3 Class Improvement
- 4 Class Improvement
- 5 Class Improvement

The U.S. Monthly Drought Outlook issued by NOAA's Climate Prediction Center on May 31, 2021, shows the persistence of current drought conditions is likely across much of Montana. In addition regions that are currently categorized as D0 (abnormally dry) may develop into drought status over the coming month.



The U.S. Seasonal Drought Outlook issued by NOAA's Climate Prediction Center on May 20, 2021, shows that persistence of drought is likely throughout the summer and that by August 31, most of the state could be designated as in drought status.



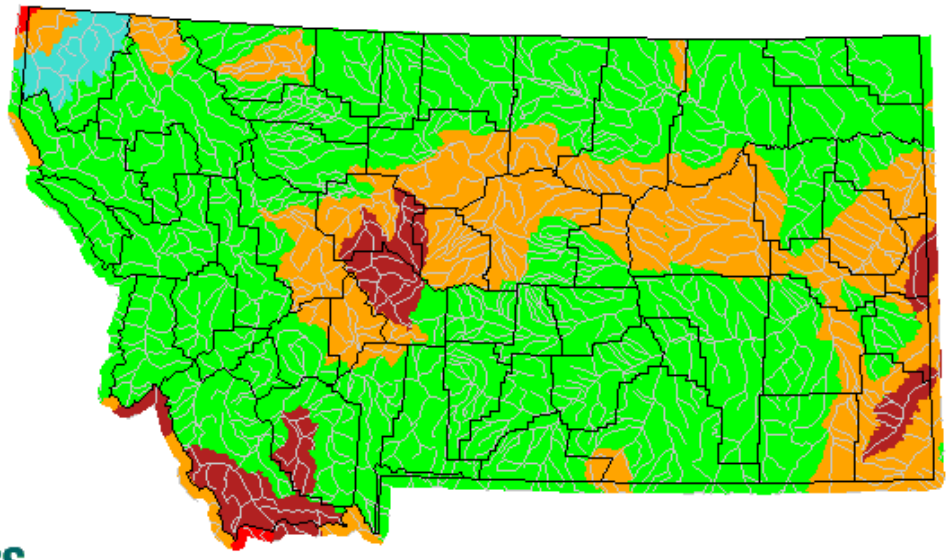
If you would like more information about current drought conditions or require assistance due to drought, the links below can help you gather information and assist you in getting in touch with the appropriate agencies.

Drought Links:

- USDA Drought Portal (News and Impacts)
- Farm Services Agency News – Montana (Information on Programs and Deadlines)
- Farm Services Agency – National (Disaster Assistance Programs)
- List of Available Disaster Emergency Services (Drought/Fire)
- Montana Department of Natural Resources and Conservation (Drought Management)

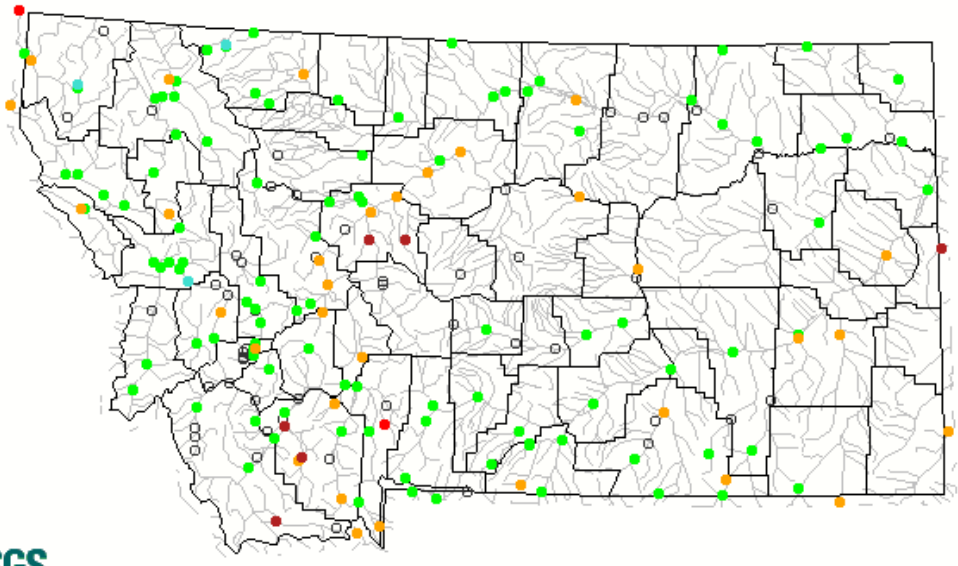
Current Streamflows – Monthly Average Streamflow Compared to Historic Data

May 2021



USGS

May 2021



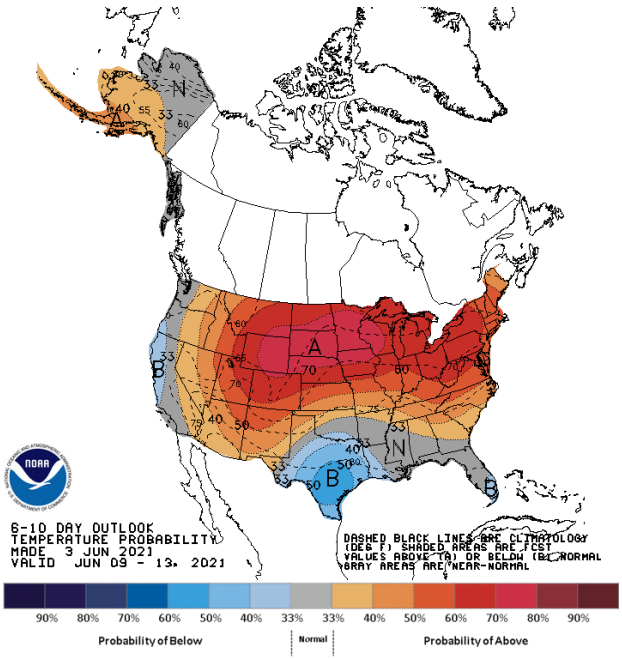
USGS

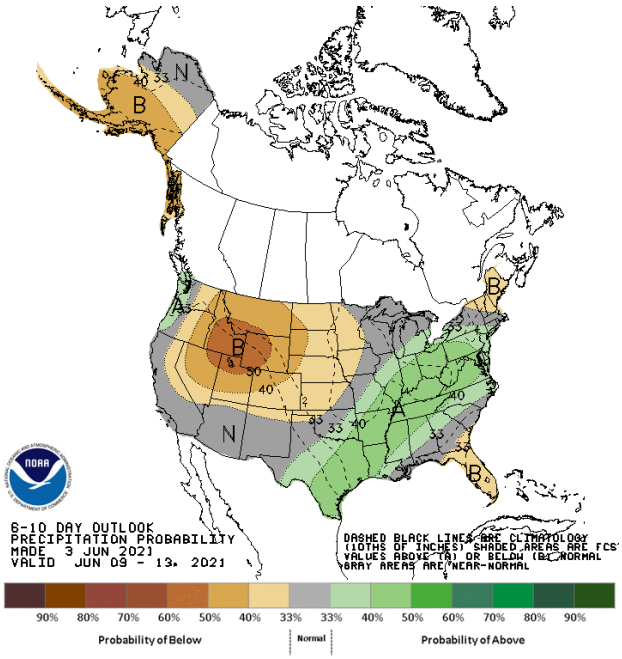
Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal		

Looking Ahead

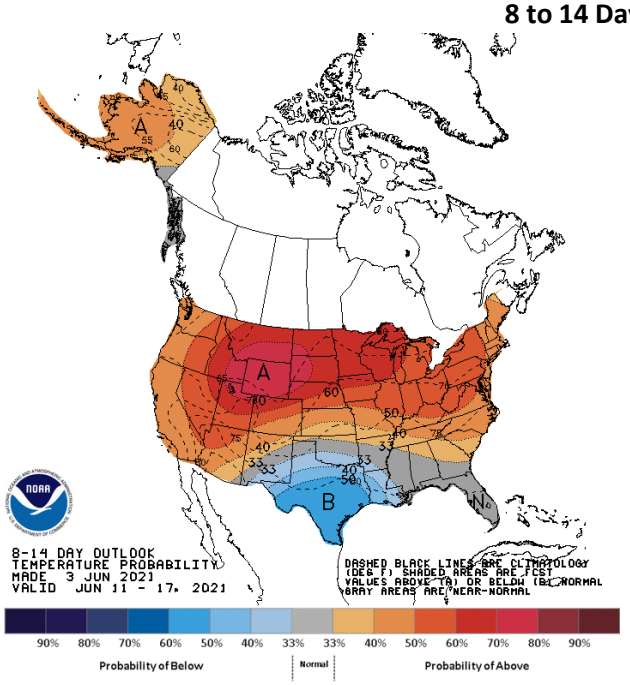
All of the model outlooks from [NOAA's Climate Prediction Center] are calling for increased chances of above average temperatures and below average precipitation in the coming days and weeks, with the highest probability for both in the upcoming 14 days. This could have wide-ranging impacts as we head into summer, including rapid melt of remaining snow and increase in wildfire risk. Though the CPC's outlooks are not a guarantee of any set of conditions, water users should be aware of the potential for a hot and dry summer.

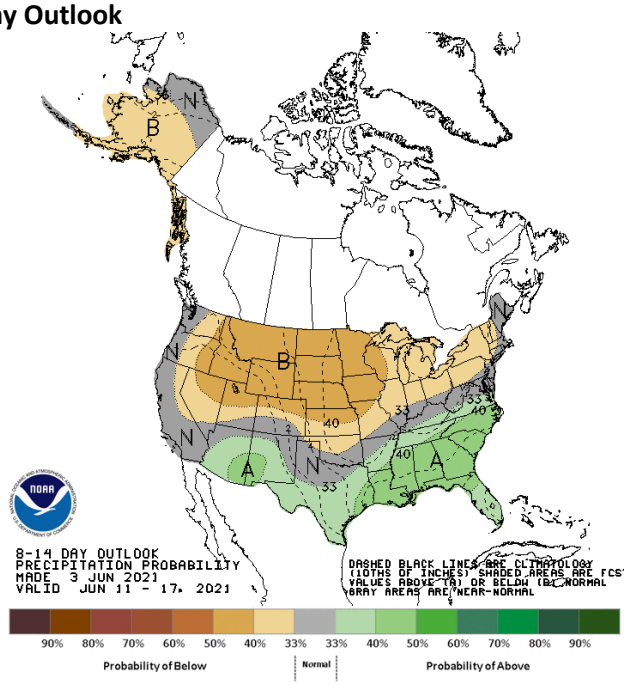
6 to 10 Day Outlook



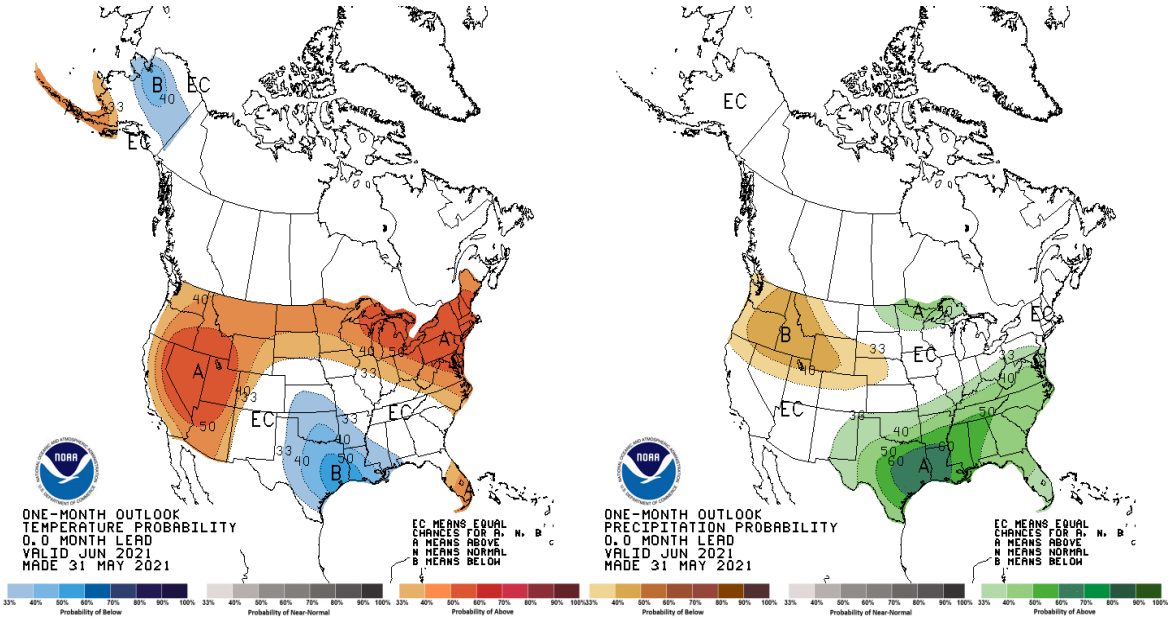


8 to 14 Day Outlook

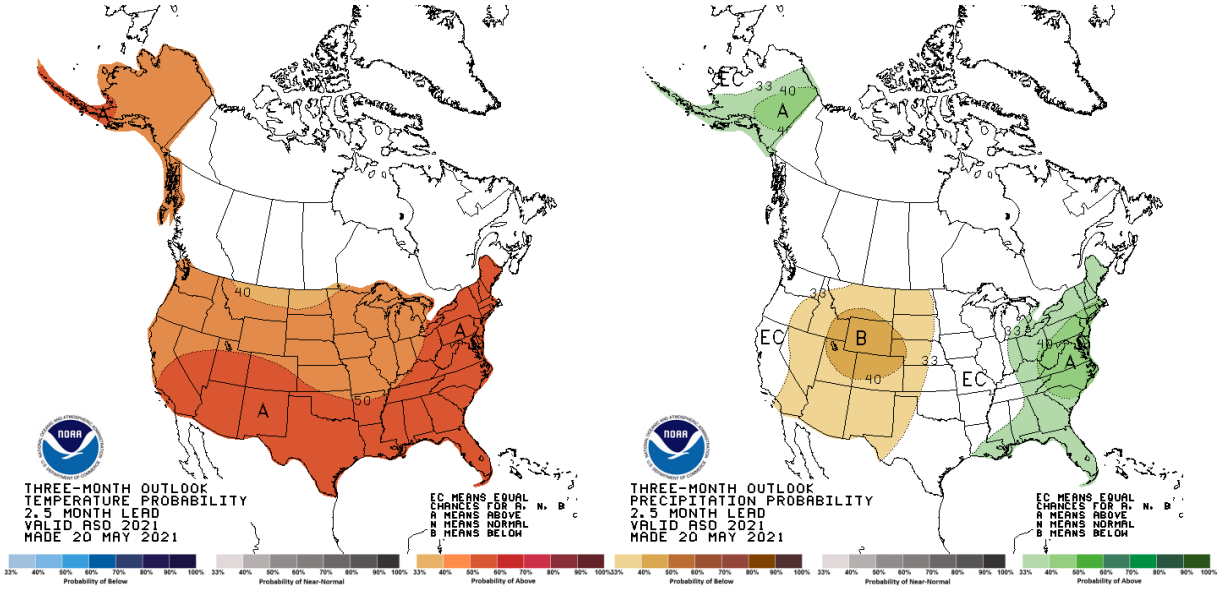




30 Day Outlook



Three Month Outlook



Reservoirs - Overview

The change in reservoir storage from May 1st to June 1st varied from above to below average across Montana. As of June 1st, most reservoirs are at near or above average storage levels. Remaining snow at upper mountain elevations will likely sustain typical reservoir inflows through July as indicated by the current streamflow forecasts. Exceptions are rivers in the furthest southwest corner of Montana and portions of central Montana, where conditions are dry and streamflow forecasts are down.

Official Streamflow Forecasts

How Forecasts Are Made

Most of the annual streamflow in the Western United States originates as snowfall that has accumulated high in the mountains during winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Predictions are based on careful measurements of snow water equivalent at selected index points. Precipitation, temperature, soil moisture and antecedent streamflow data are combined with snowpack data to prepare runoff forecasts.

Snowpack measurements are obtained by using a combination of manual and automated SNOTEL measurement methods. Manual readings of snow depth and water equivalent are taken at locations called snow courses on a monthly or semi-monthly schedule during the winter. At automated stations, snow depth and snow water equivalent as well as precipitation and temperature are monitored on a daily basis. Both monthly and daily data are used to project snowmelt runoff.

Forecast uncertainty originates from two sources: (1) uncertainty of future hydrologic and climatic conditions, and (2) error in the forecasting procedure. To express the uncertainty in the most probable forecast, four additional forecasts are provided. The actual streamflow can be expected to exceed the most probable forecast 50% of the time. Similarly, the actual streamflow volume can be expected to exceed the 90% forecast volume 90% of the time. The same is true for the 70%, 30%, and 10% forecasts. Generally, the 90% and 70% forecasts reflect drier than normal hydrologic and climatic conditions; the 30% and 10% forecasts reflect wetter than normal conditions. As the forecast season progresses, a greater portion of the future hydrologic and climatic uncertainty will become known and the additional forecasts will move closer to the most probable forecasts.

Summary

Snowmelt and the resulting seasonal runoff that began in April was thwarted by a return to cool, winter weather in mid - May. This cooler weather pattern also brought much needed precipitation to many regions in Montana, providing moisture to soils and boosting existing snowpacks at high elevations. Delayed snowmelt and additional moisture have bumped forecast percentages for June - July streamflow volumes for some river basins compared to those issued last month for May – July.

Precipitation from 2 major storm systems in May made great strides in recovering deficits in river basins West of the Divide. 50 percent exceedance forecasts across the region are now mostly calling for near to above normal flows for June - July. The Bitterroot river forecasts are the slight outlier at 80 – 90% of the 30-year (1981-2010) average.

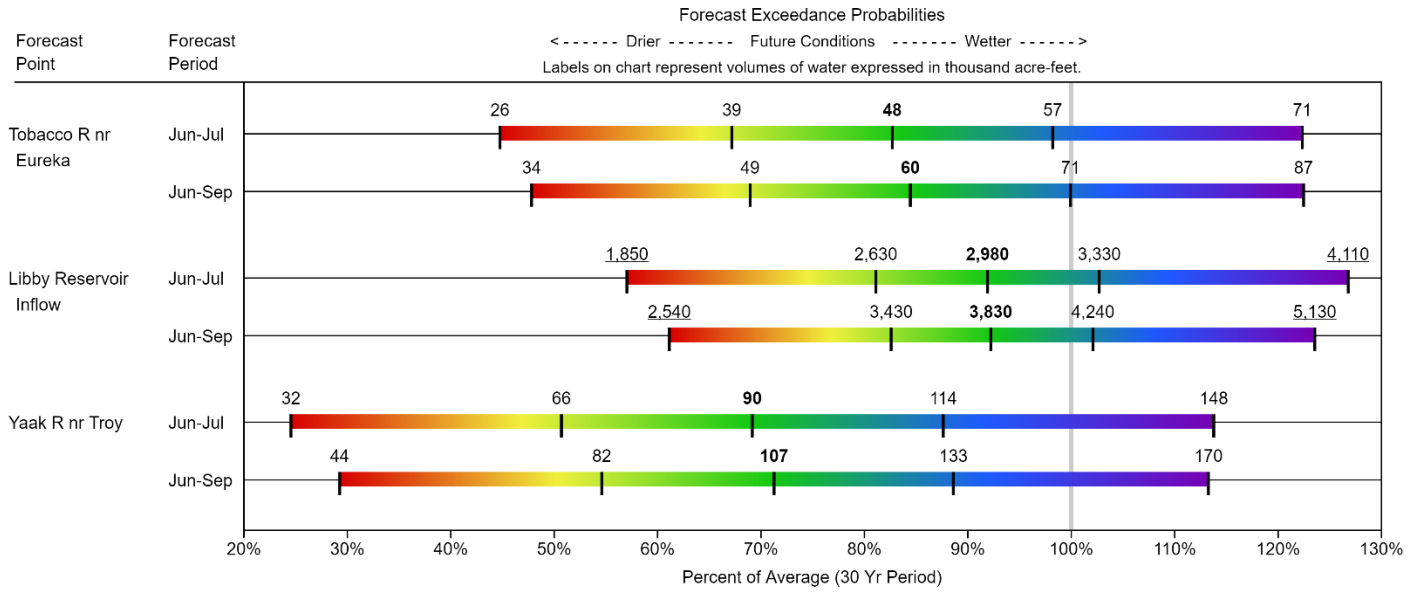
East of the Divide, current streamflow forecasts vary widely. The Rocky Mountain Front saw the greatest May precipitation totals, as a percent of average, which boosted forecasts for that region to near normal. Water users in the Gallatin river basin can also expect near normal flows for the remainder of the runoff season. Yellowstone River flows are expected to be slightly below normal for June – July and June – September but the forecasts for most of its main tributaries range from 90 -100% of average.

The Jefferson and Madison river basins, which have been a concern for most of the season, did receive precipitation in May, but it was not enough to make up for water year deficits from the lack of precipitation in March and April. The current 50 percent exceedance forecasts remain well below normal for all streams in these basins. Water users and managers in the Beaverhead and Ruby river basins should be prepared for well below normal runoff for the remainder of this season. Forecasts for the Beaverhead are extremely low and water managers should plan according

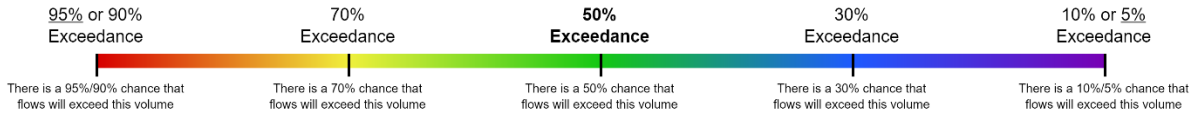
KOOTENAI RIVER BASIN in MONTANA

Water Supply Forecasts

June 1, 2021



Legend



When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

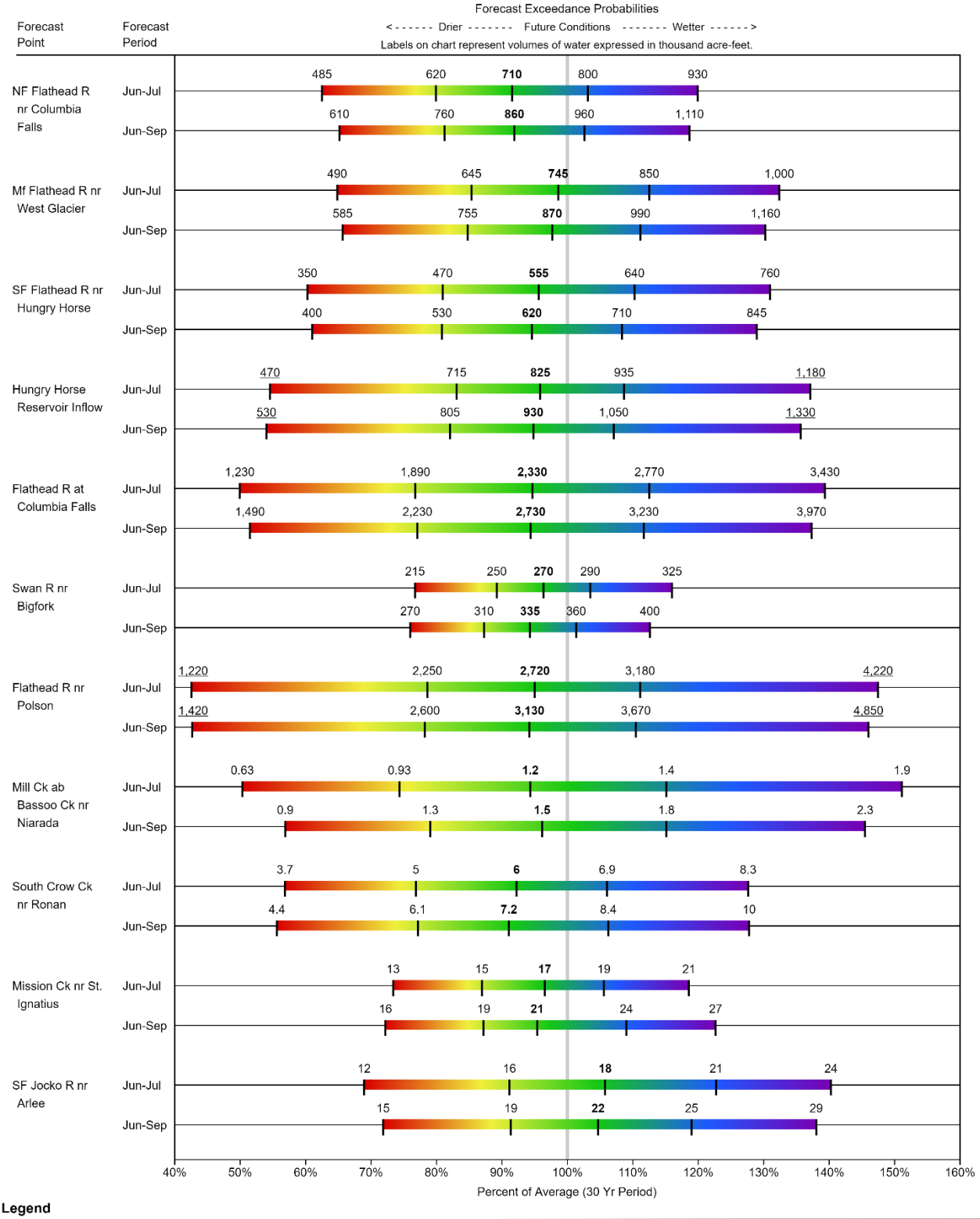
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

FLATHEAD RIVER BASIN

Water Supply Forecasts

June 1, 2021



Legend

95% or 90% Exceedance	70% Exceedance	**50% Exceedance**	30% Exceedance	10% or 5% Exceedance
There is a 95%/90% chance that flows will exceed this volume	There is a 70% chance that flows will exceed this volume	There is a 50% chance that flows will exceed this volume	There is a 30% chance that flows will exceed this volume	There is a 10%/5% chance that flows will exceed this volume

When selected, the following historic streamflow values and statistics will be shown.

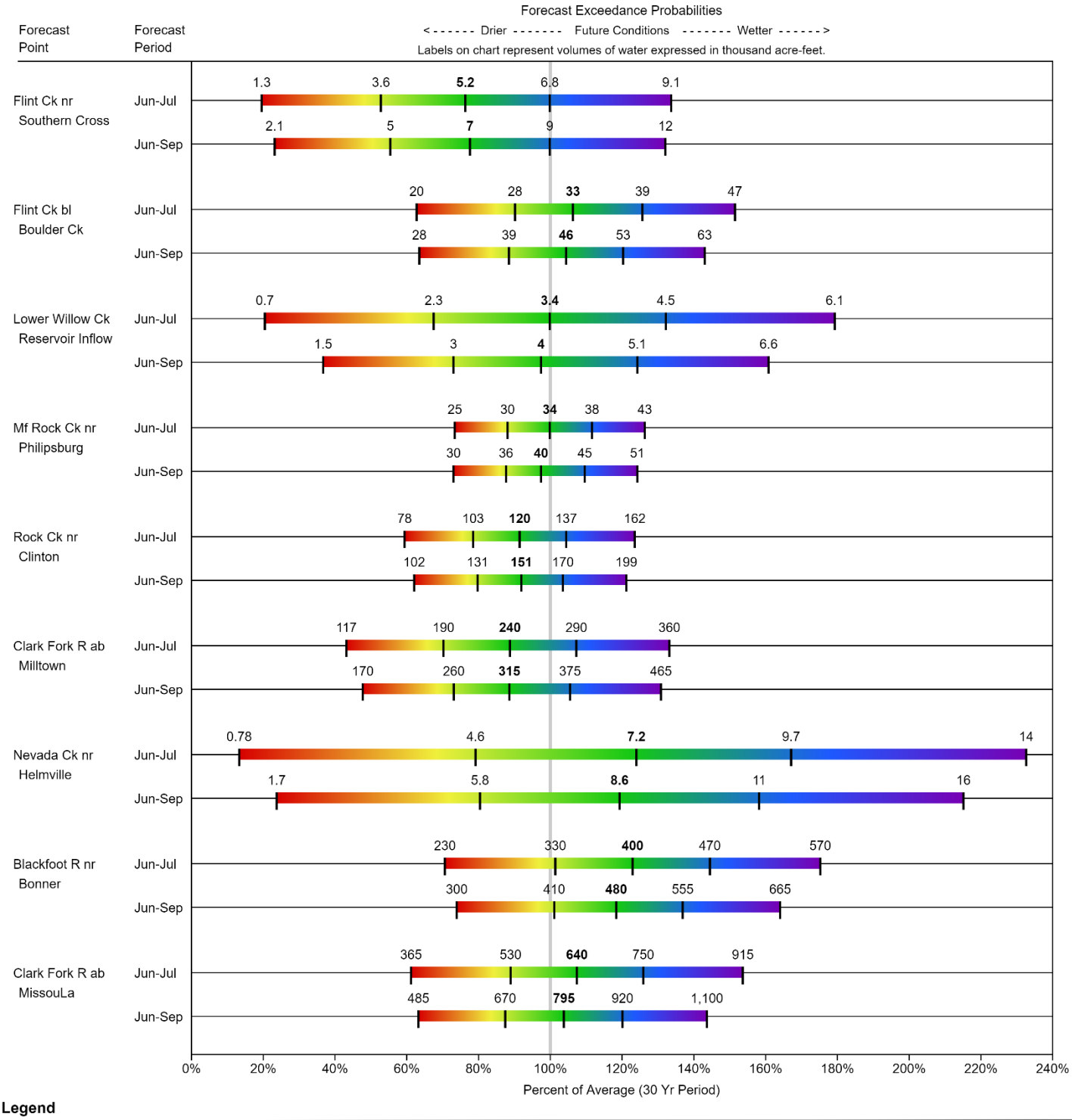
Period of Record Minimum Streamflow KAF (Year)	*1981-2010 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

UPPER CLARK FORK RIVER BASIN

Water Supply Forecasts

June 1, 2021



Legend

95% or 90% Exceedance — There is a 95%/90% chance that flows will exceed this volume

70% Exceedance — There is a 70% chance that flows will exceed this volume

50% Exceedance — There is a 50% chance that flows will exceed this volume

30% Exceedance — There is a 30% chance that flows will exceed this volume

10% or 5% Exceedance — There is a 10%/5% chance that flows will exceed this volume

When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

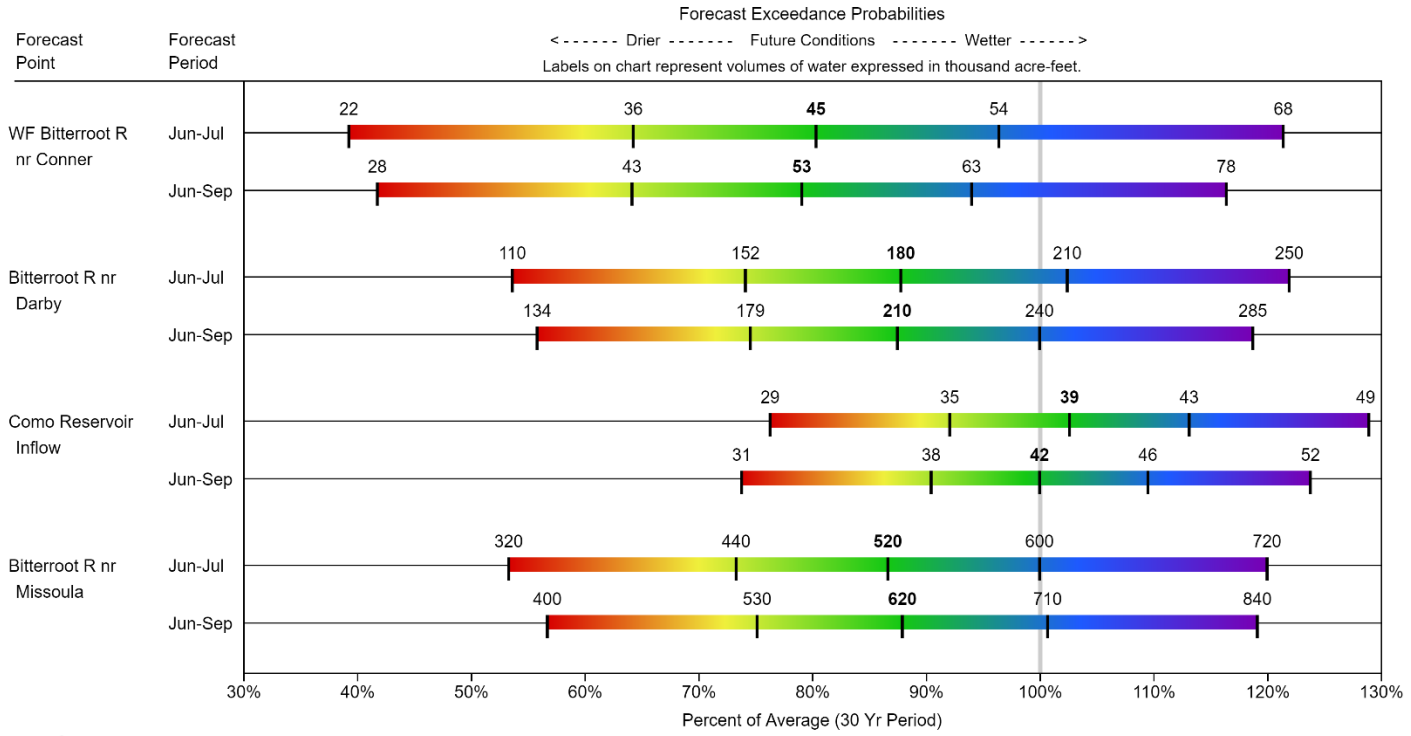
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

BITTERROOT RIVER BASIN

Water Supply Forecasts

June 1, 2021



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When selected, the following historic streamflow values and statistics will be shown.

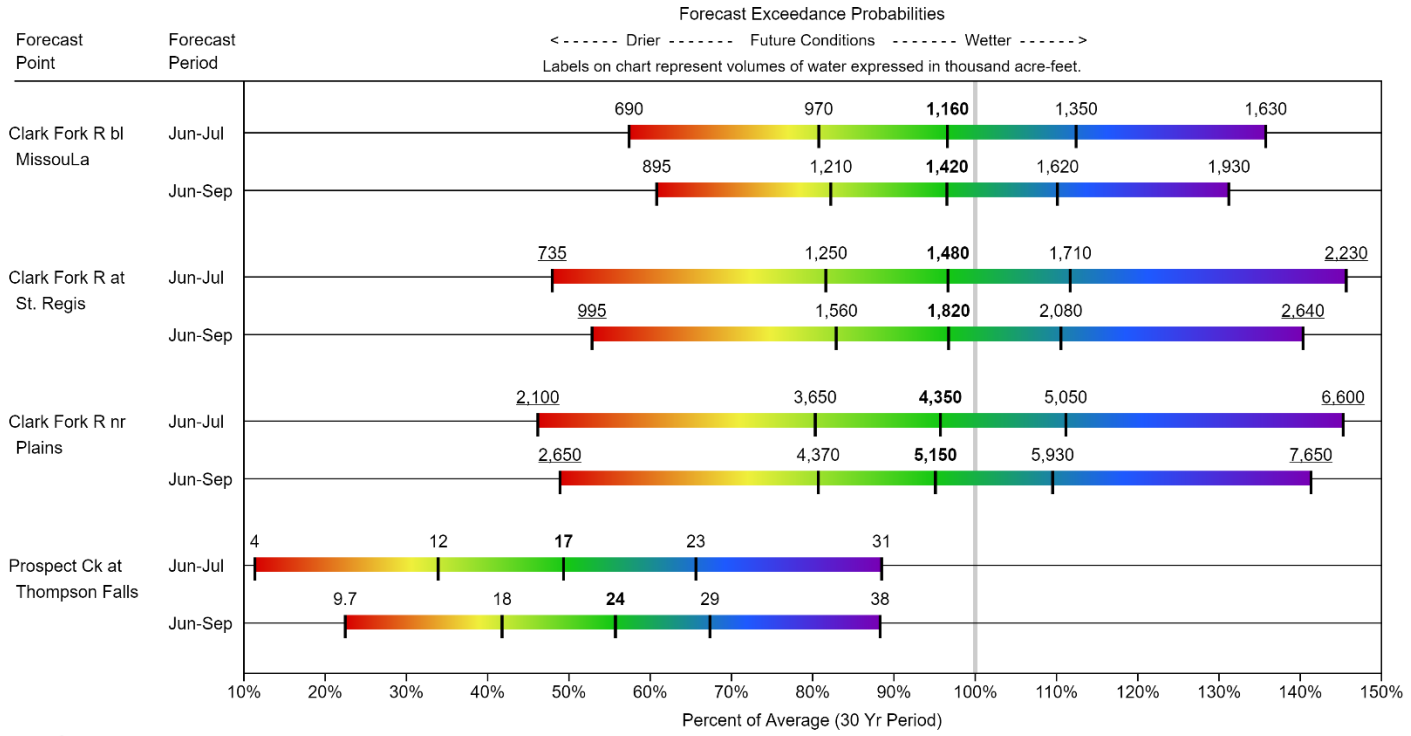
Period of Record Minimum Streamflow KAF (Year)	*1981-2010 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

LOWER CLARK FORK RIVER BASIN

Water Supply Forecasts

June 1, 2021



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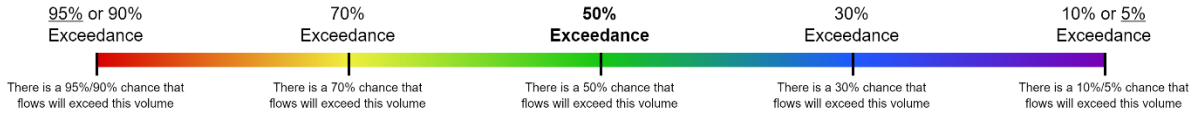


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

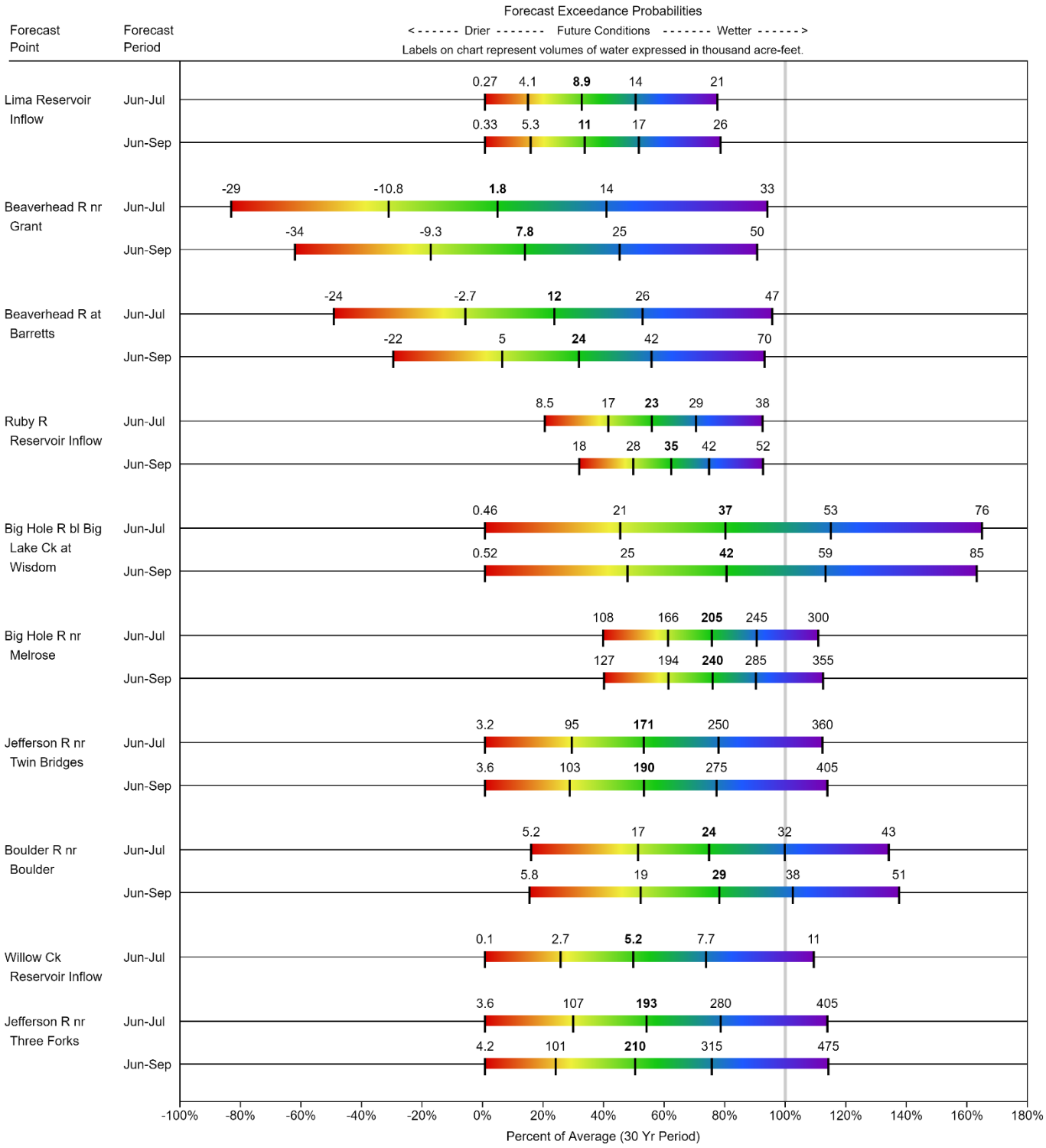
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

JEFFERSON RIVER BASIN

Water Supply Forecasts

June 1, 2021



Legend

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70% Exceedance — There is a 70% chance that flows will exceed this volume

50% Exceedance — There is a 50% chance that flows will exceed this volume

30% Exceedance — There is a 30% chance that flows will exceed this volume

10% or 5% Exceedance — There is a 10%/5% chance that flows will exceed this volume

When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

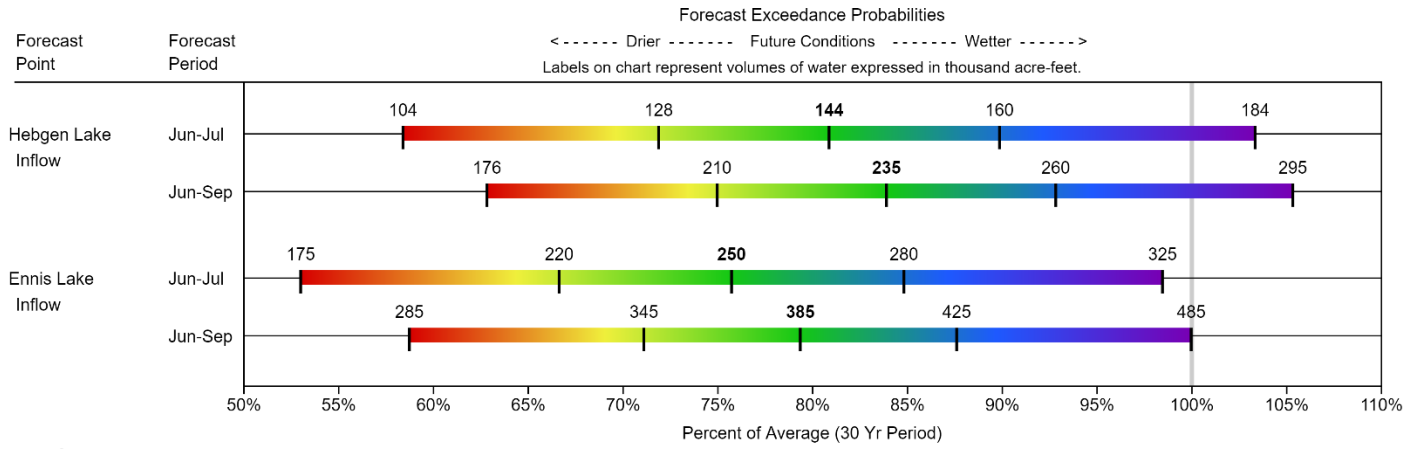
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

MADISON RIVER BASIN

Water Supply Forecasts

June 1, 2021



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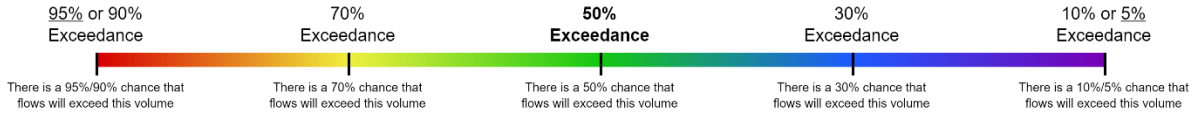


When selected, the following historic streamflow values and statistics will be shown.

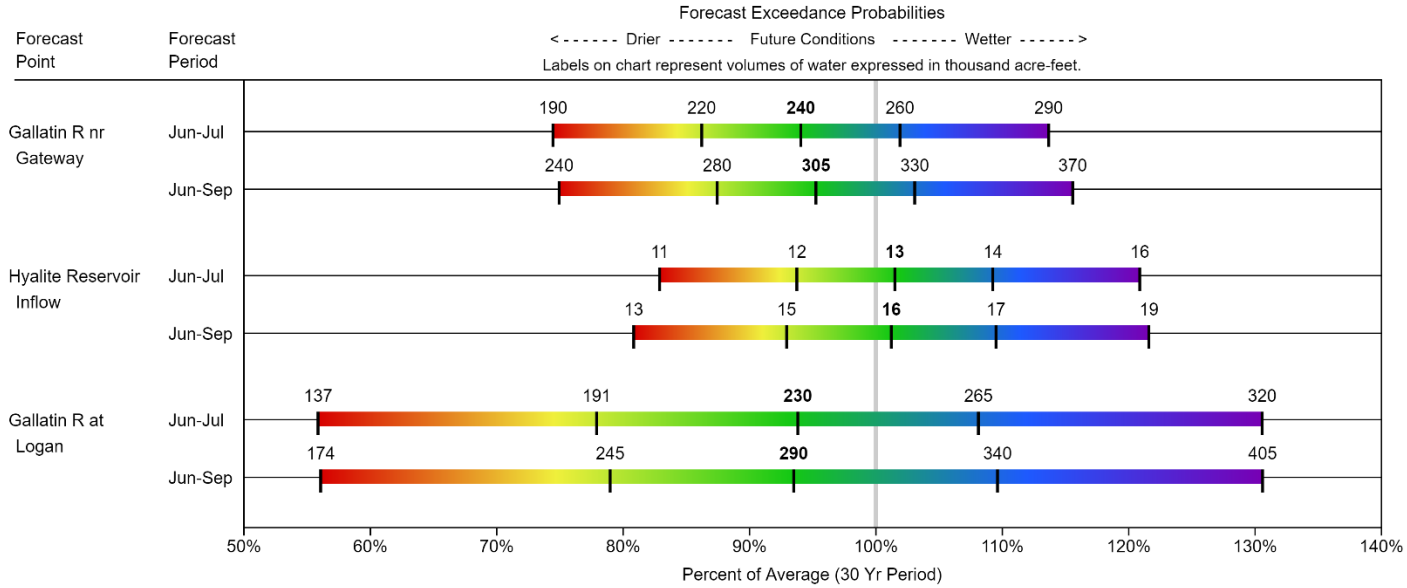
Period of Record Minimum Streamflow KAF (Year) | *1981-2010 Normal Streamflow KAF* | *Observed Streamflow KAF* | *Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

GALLATIN RIVER BASIN

Water Supply Forecasts

June 1, 2021



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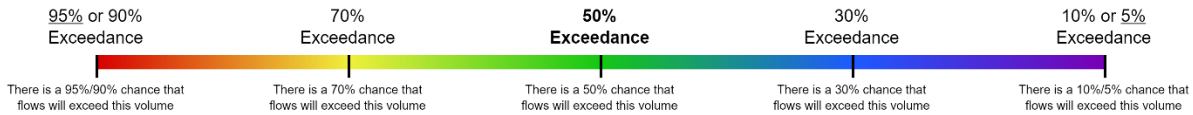


When selected, the following historic streamflow values and statistics will be shown.

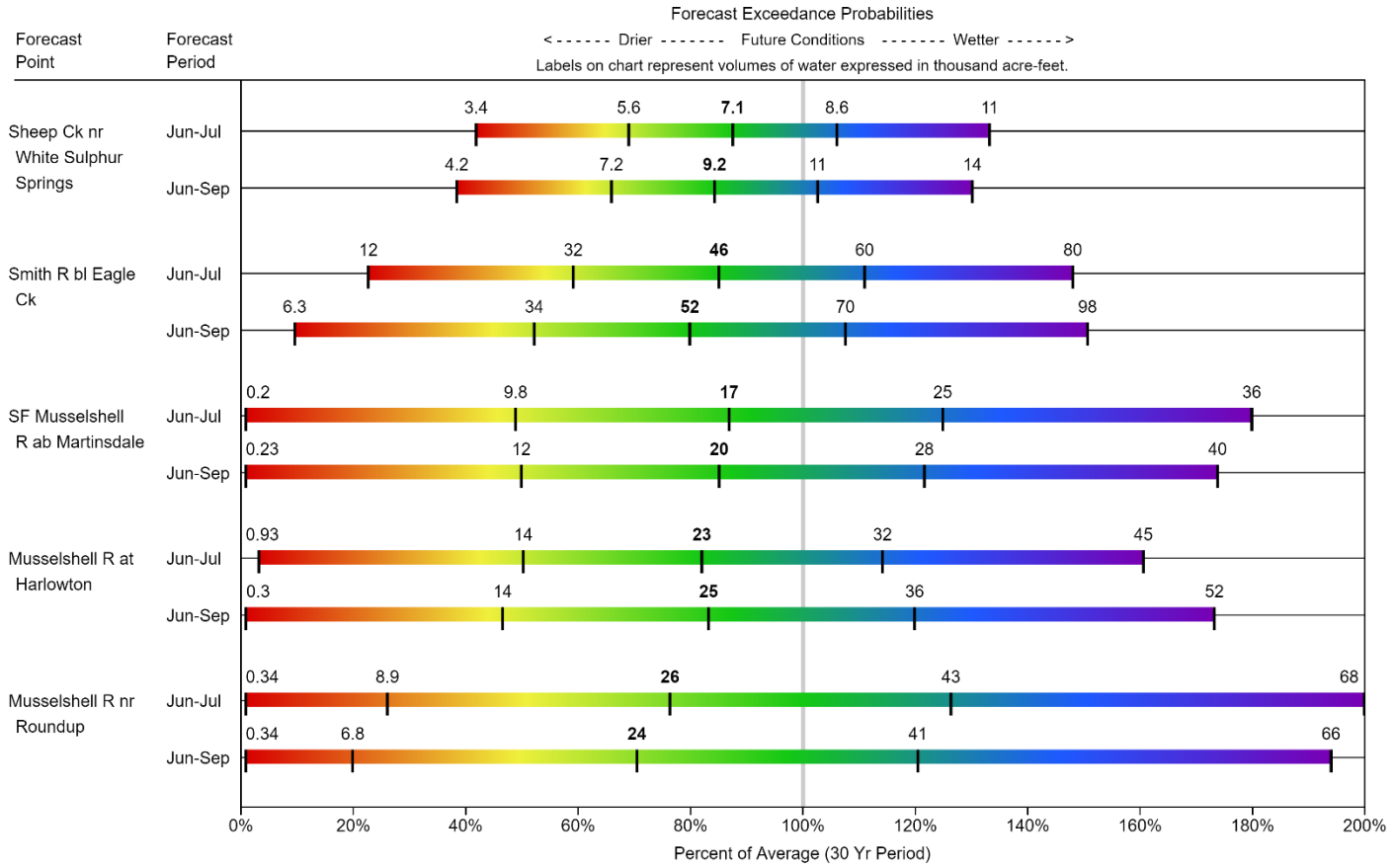
Period of Record Minimum Streamflow KAF (Year) | *1981-2010 Normal Streamflow KAF* | *Observed Streamflow KAF* | *Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

SMITH-JUDITH-MUSSELSHELL

Water Supply Forecasts

June 1, 2021



Legend

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There is a 95%/90% chance that flows will exceed this volume	There is a 70% chance that flows will exceed this volume	There is a 50% chance that flows will exceed this volume	There is a 30% chance that flows will exceed this volume	There is a 10%/5% chance that flows will exceed this volume

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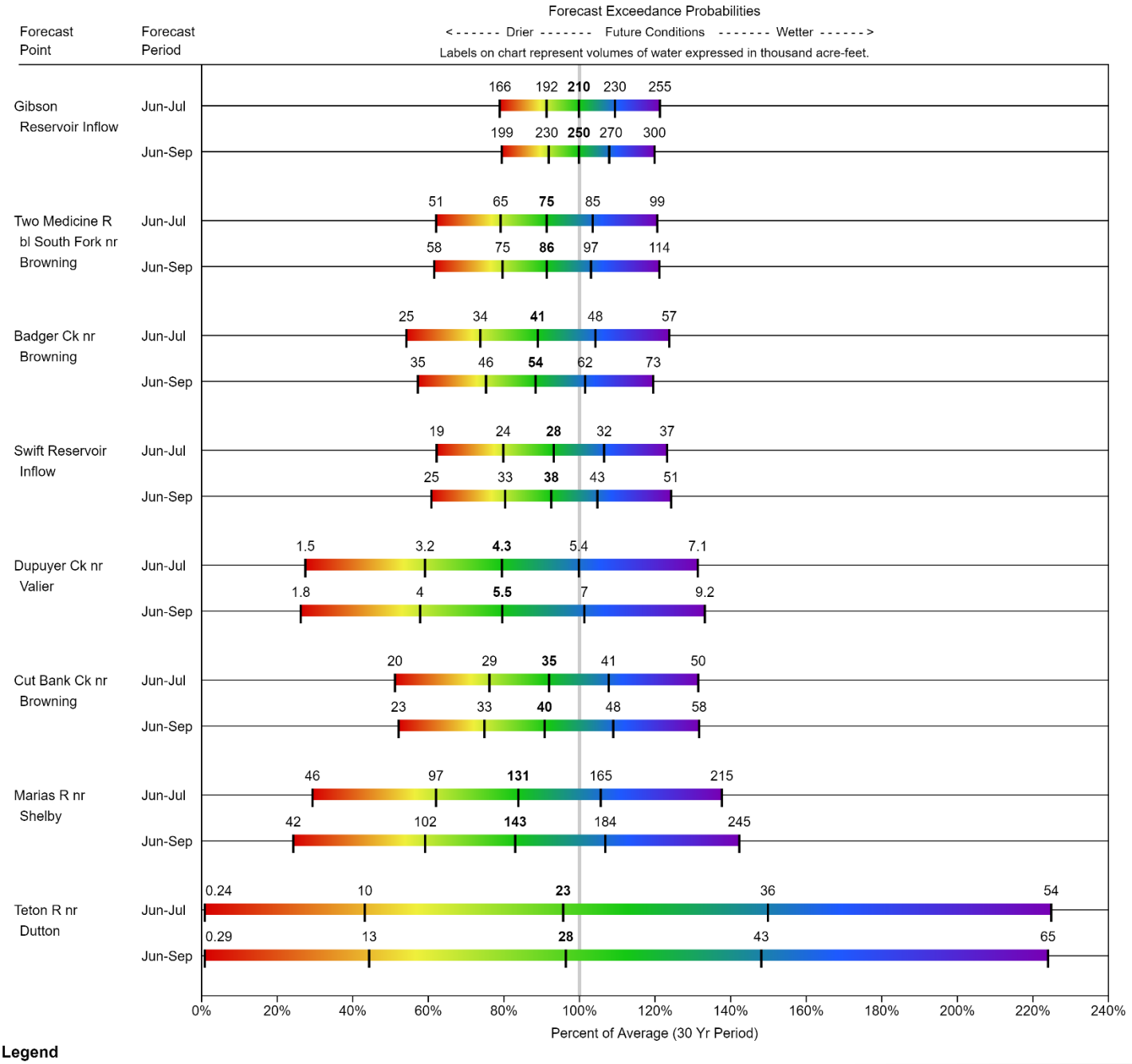
Period of Record Minimum Streamflow KAF (Year)	*1981-2010 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

SUN-TETON-MARIAS

Water Supply Forecasts

June 1, 2021



Legend

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70% Exceedance — There is a 70% chance that flows will exceed this volume

50% Exceedance — There is a 50% chance that flows will exceed this volume

30% Exceedance — There is a 30% chance that flows will exceed this volume

10% or 5% Exceedance — There is a 10%/5% chance that flows will exceed this volume

When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

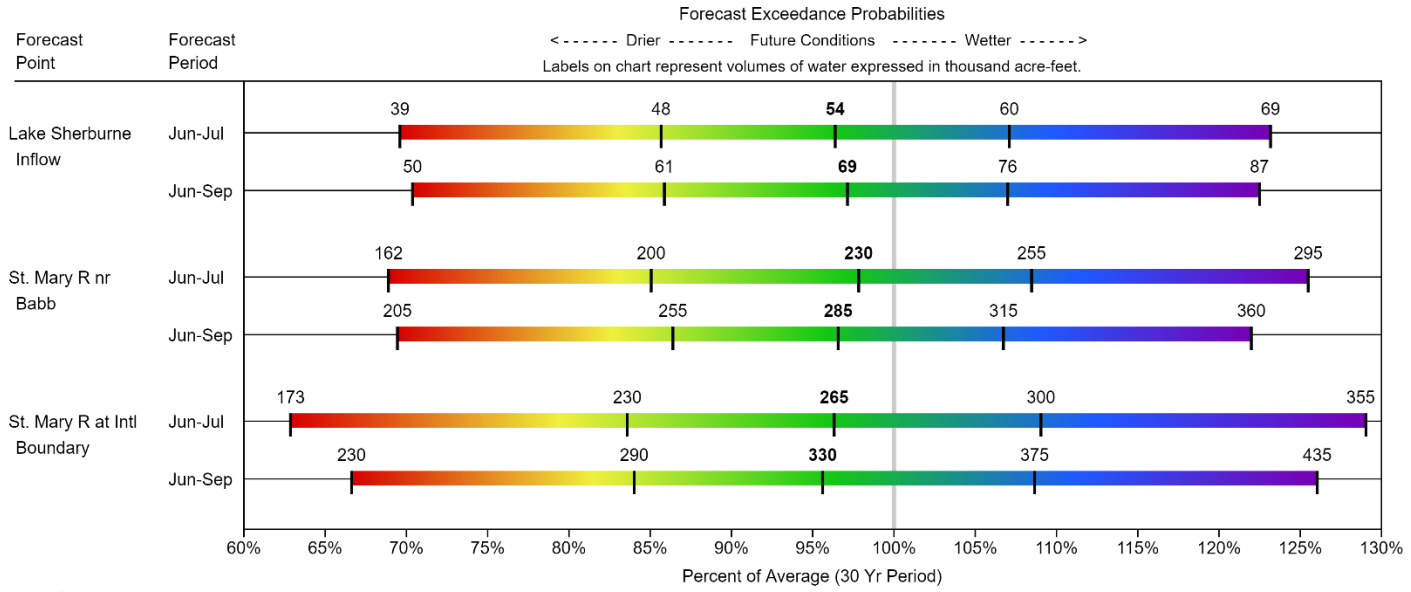
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

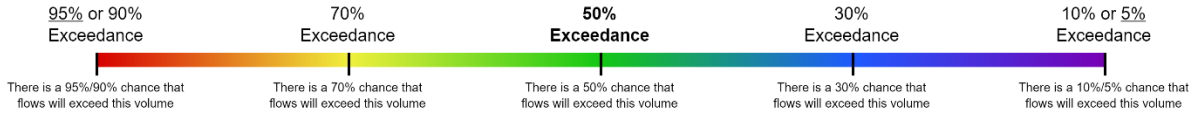
ST. MARY & MILK BASINS

Water Supply Forecasts

June 1, 2021



Legend



When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

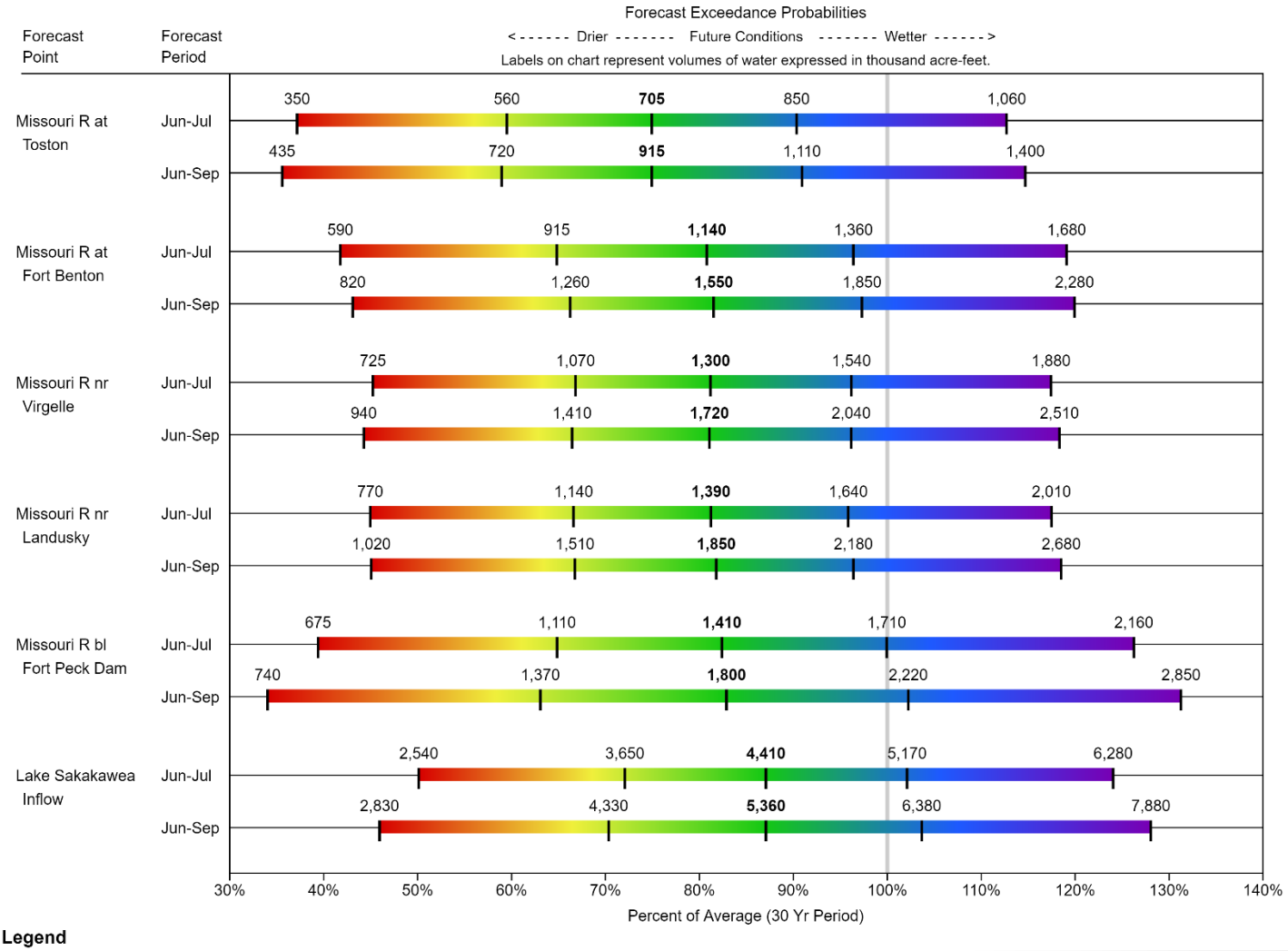
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

MISSOURI MAINSTEM BASIN

Water Supply Forecasts

June 1, 2021



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Observed Streamflow KAF

Period of Record Maximum Streamflow KAF (Year)

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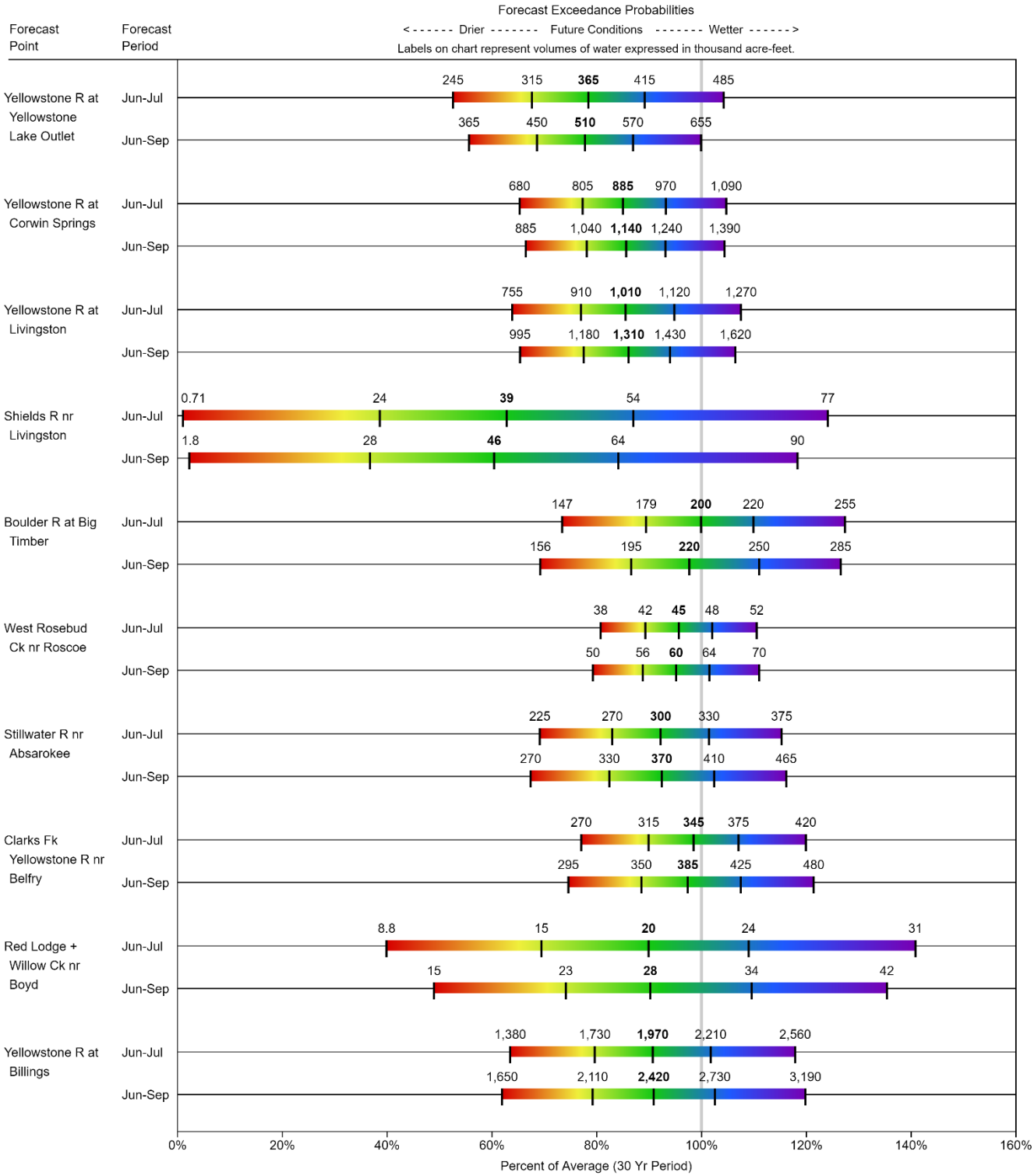
UPPER YELLOWSTONE RIVER BASIN

Water Supply Forecasts

June 1, 2021



Legend

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1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

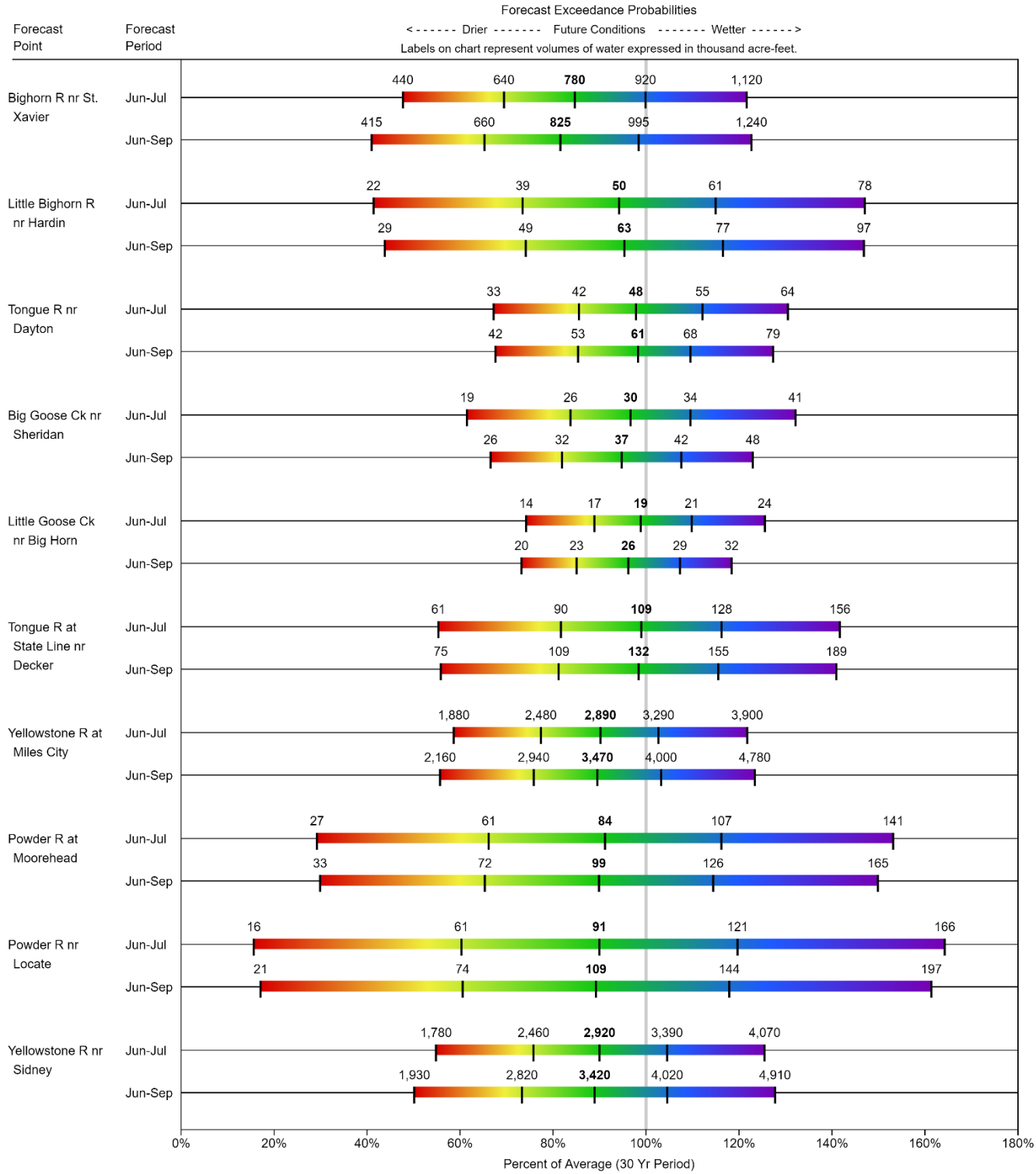
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

LOWER YELLOWSTONE RIVER BASIN (Wyoming)

Water Supply Forecasts

June 1, 2021



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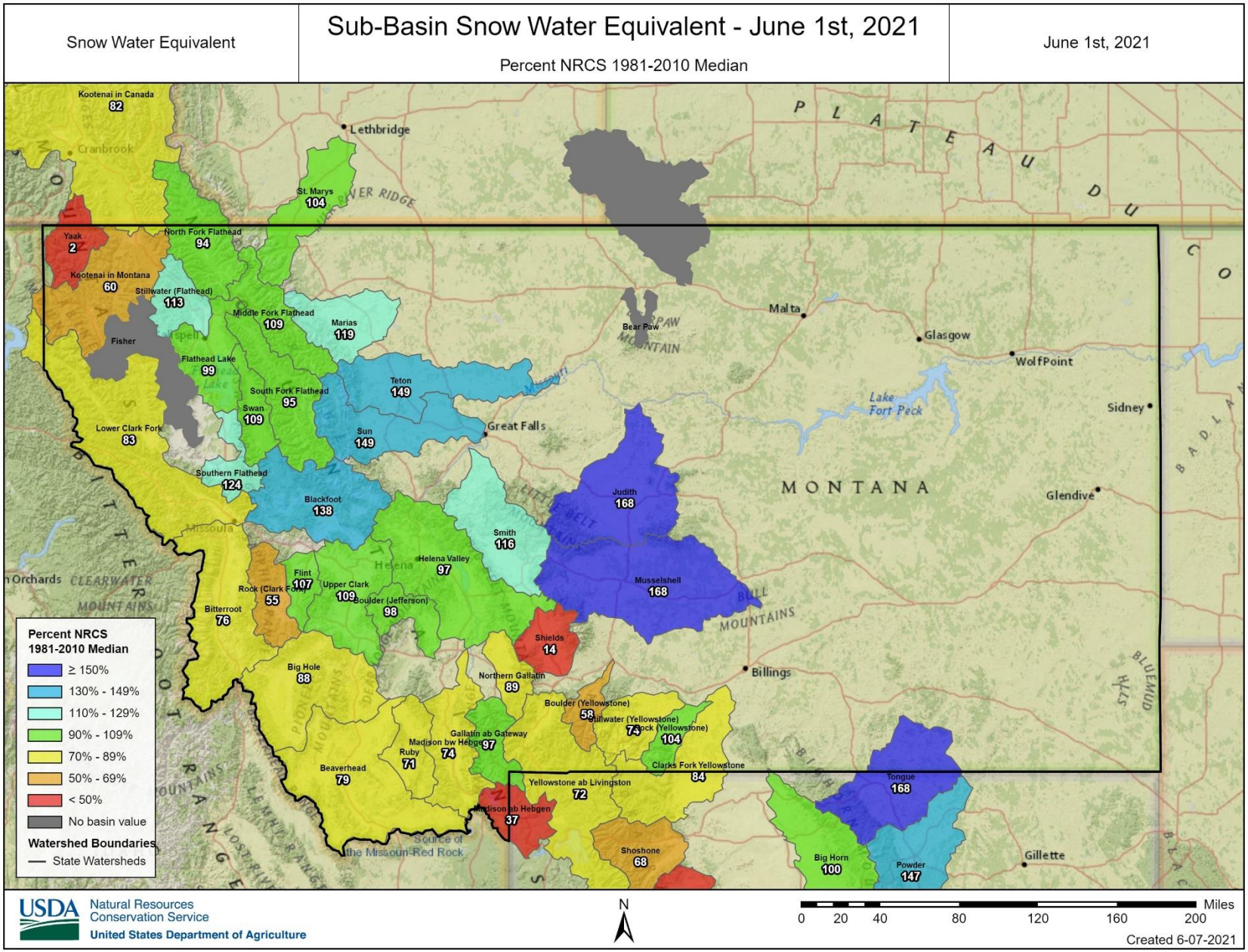
1981-2010 Normal Streamflow KAF

Observed Streamflow KAF

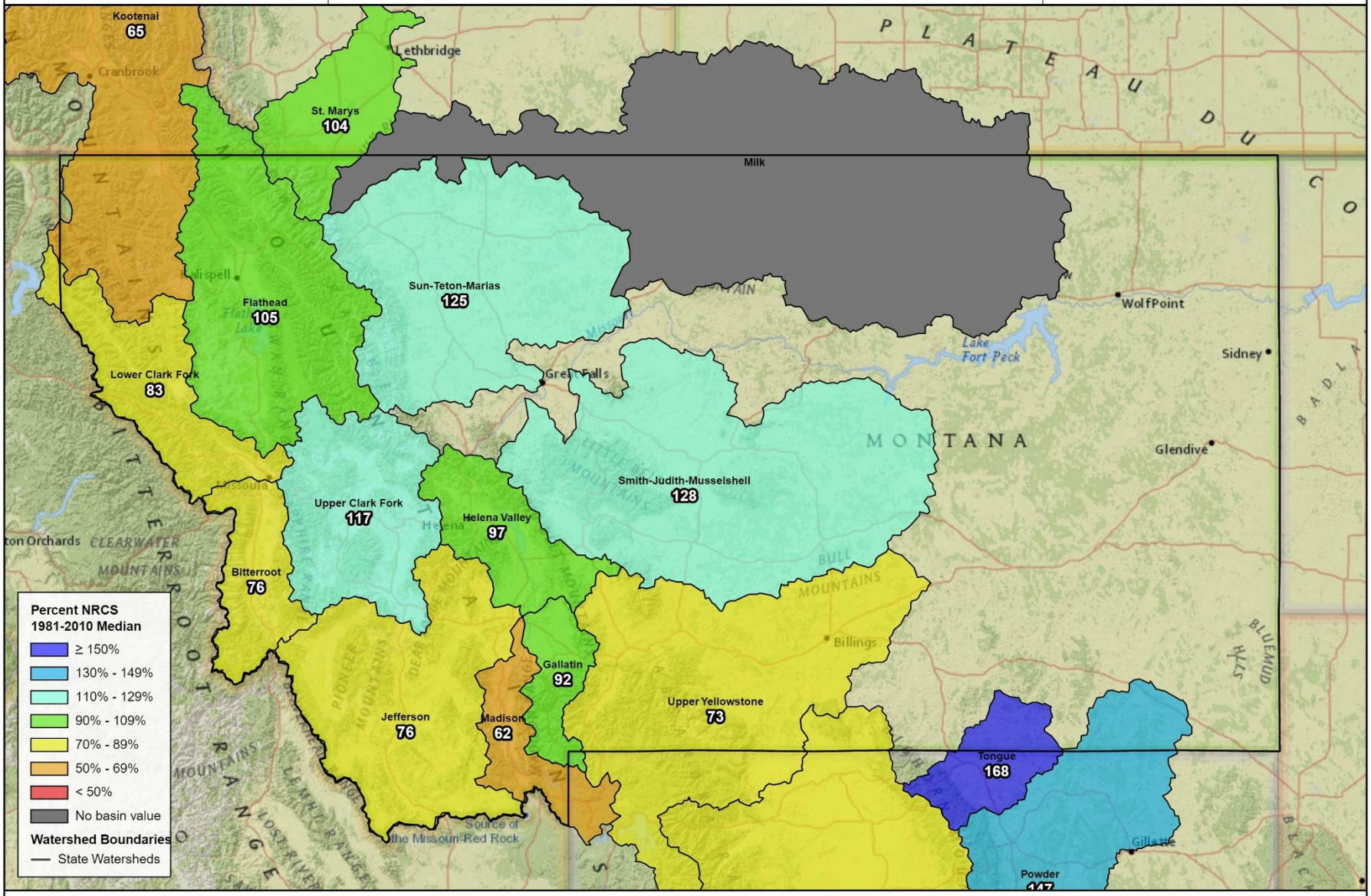
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

Maps


Snow Water Equivalent
Sub-Basin Snow Water Equivalent - June 1st, 2021
Percent NRCS 1981-2010 Median
June 1st, 2021
Kootenai in Canada 82
Lethbridge
Cranbrook
St. Marys 104
Yaak 2
North Fork Flathead 94
Kootenai in Montana 60
Stillwater (Flathead) 113
Middle Fork Flathead 109
Marias 119
Fisher
Flathead Lake 99
South Fork Flathead 95
Swan 109
Lower Clark Fork 83
Teton 149
Sun 149
Great Falls
Southern Flathead 124
Blackfoot 138
Missoula
Smith 116
Helena Valley 97
Flint 107
Upper Clark 109
Rock (Clark Fork) 55
Boulder (Jefferson) 98
Bitterroot 76
Big Hole 88
Beaverhead 79
Ruby 71
Madison bw Hebgen 74
Gallatin ab Gateway 97
Northern Gallatin 89
Shields 14
Judith 168
Musselshell 168
Bear Paw
Malta
Glasgow
WolfPoint
Lake Fort Peck
Sidney
Glendive
MONTANA
Billings
Boulder (Yellowstone) 58
Stillwater (Yellowstone) 74
Rock (Yellowstone) 104
Clarks Fork Yellowstone 84
Yellowstone ab Livingston 72
Madison ab Hebgen 37
Shoshone 68
Tongue 168
Big Horn 100
Powder 147
Gillette
Percent NRCS 1981-2010 Median
≥ 150%
130% - 149%
110% - 129%
90% - 109%
70% - 89%
50% - 69%
< 50%
No basin value
Watershed Boundaries
State Watersheds
USDA Natural Resources Conservation Service
United States Department of Agriculture
N
0 20 40 80 120 160 200 Miles
Created 6-07-2021

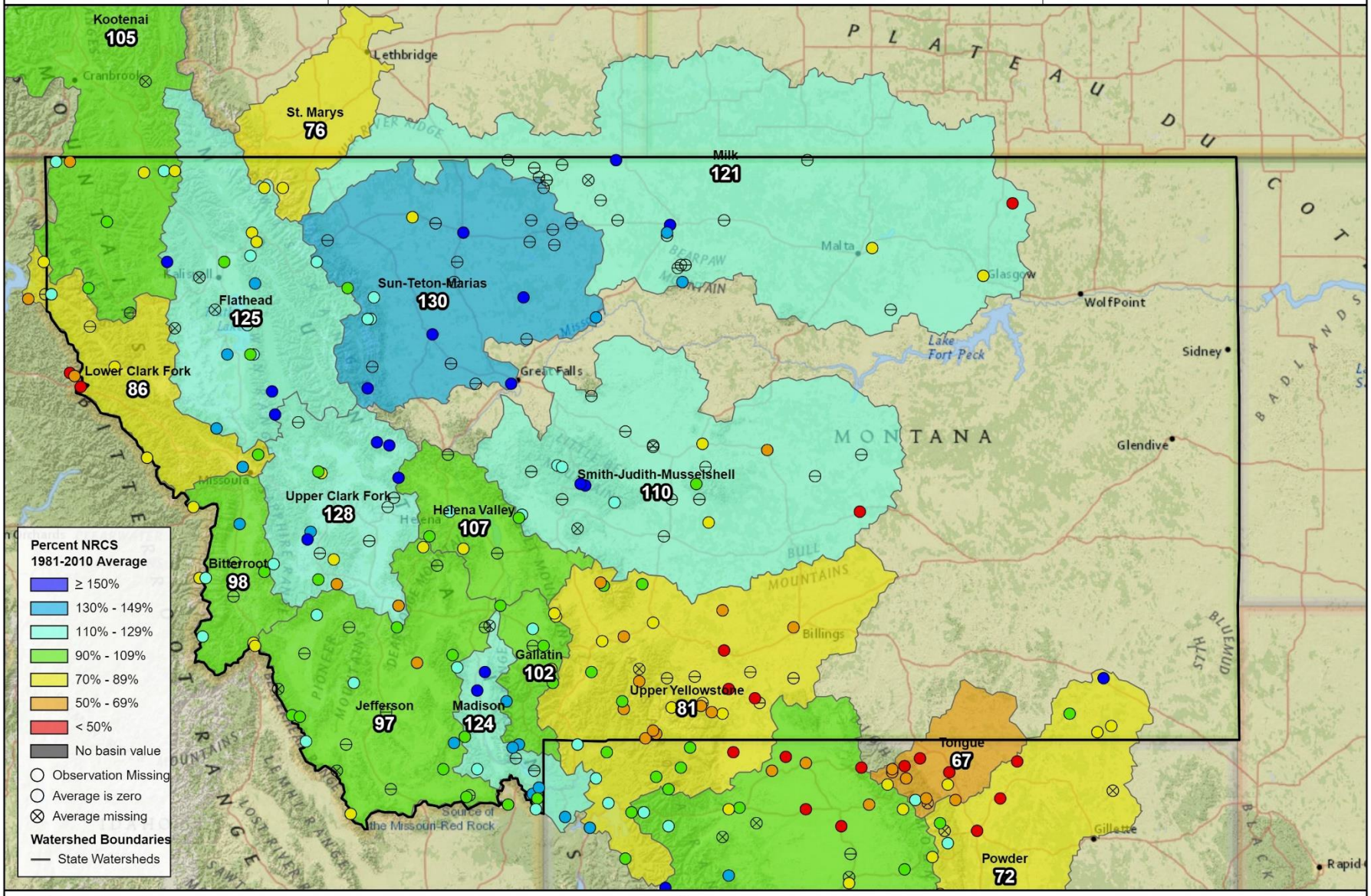
Snow Water Equivalent	Major Basin Snow Water Equivalent - June 1st, 2021 Percent NRCS 1981-2010 Median	June 1st, 2021



USDA Natural Resources Conservation Service
United States Department of Agriculture

Created 6-07-2021

1 month Precipitation	Monthly Basin Precipitation - May 2021 Percent NRCS 1981-2010 Average	May 1, 2021 - May 31, 2021



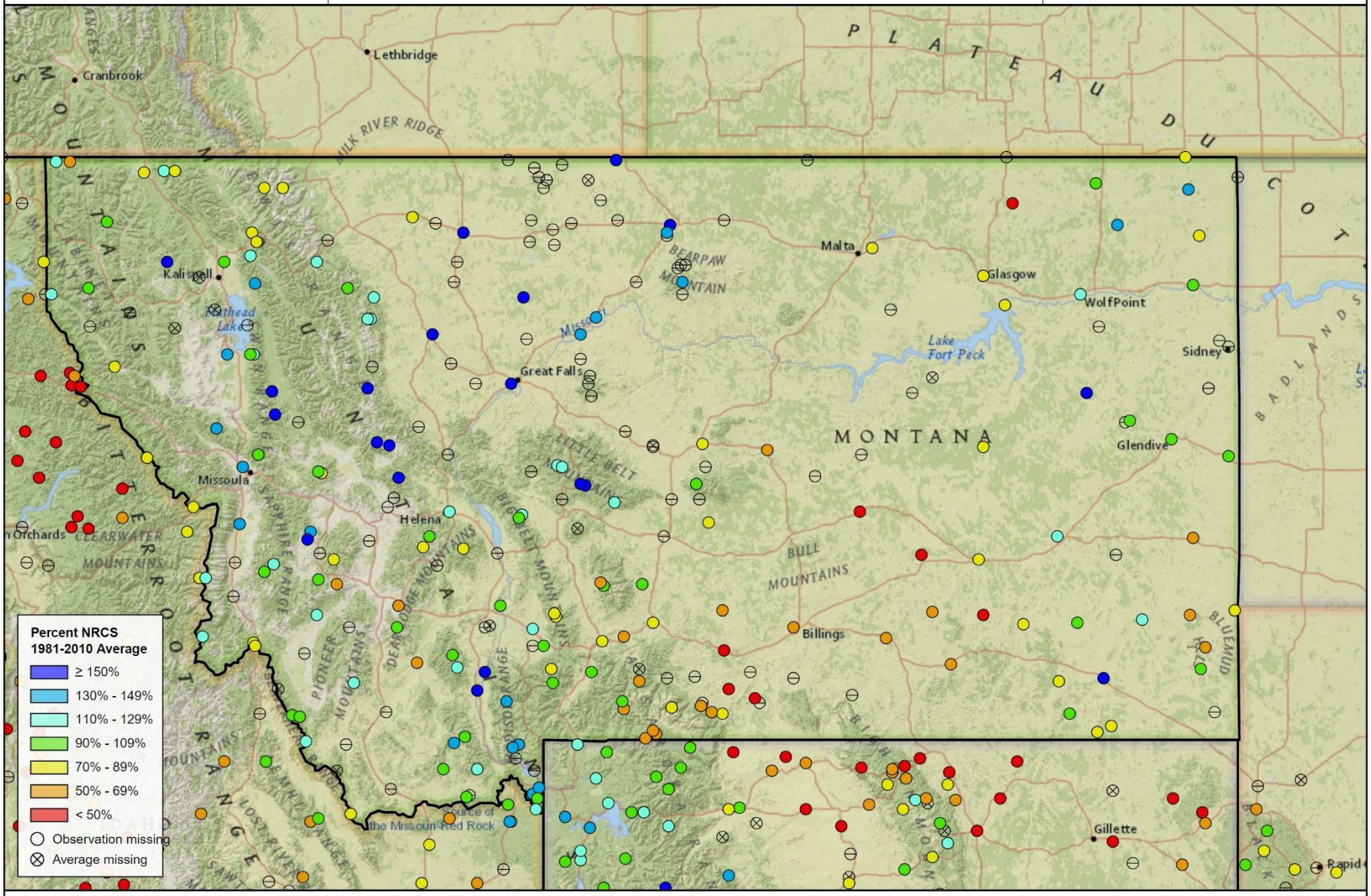
USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

Created 6-07-2021

1 month Precipitation	Monthly Precipitation - May 2021 Percent NRCS 1981-2010 Average	May 1, 2021 - May 31, 2021



USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

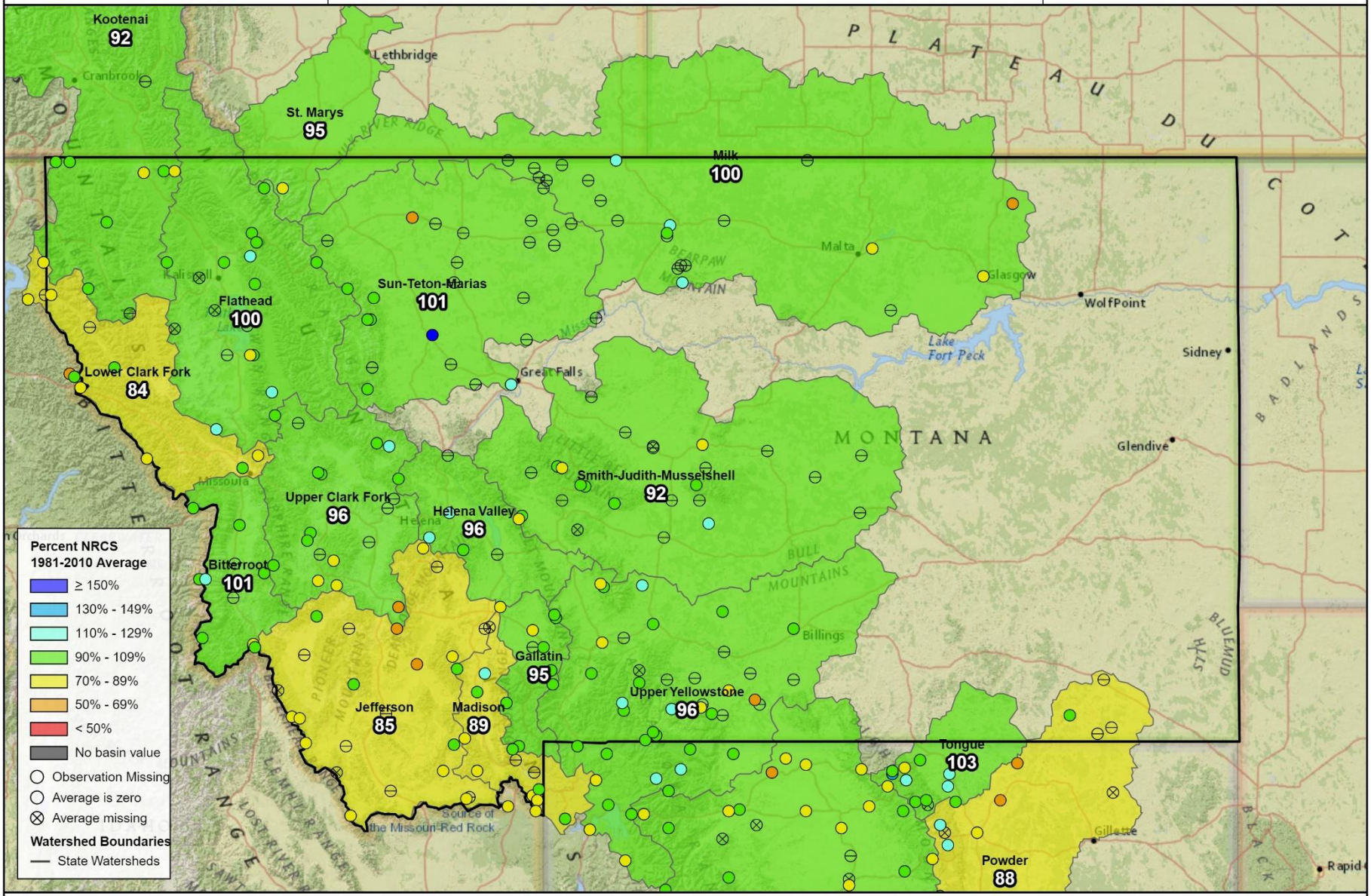
Created 6-07-2021

Water Year to Date Precipitation

Basin Water Year Precipitation - June 1st, 2021

Percent NRCS 1981-2010 Average

October 1, 2020 - May 31, 2021



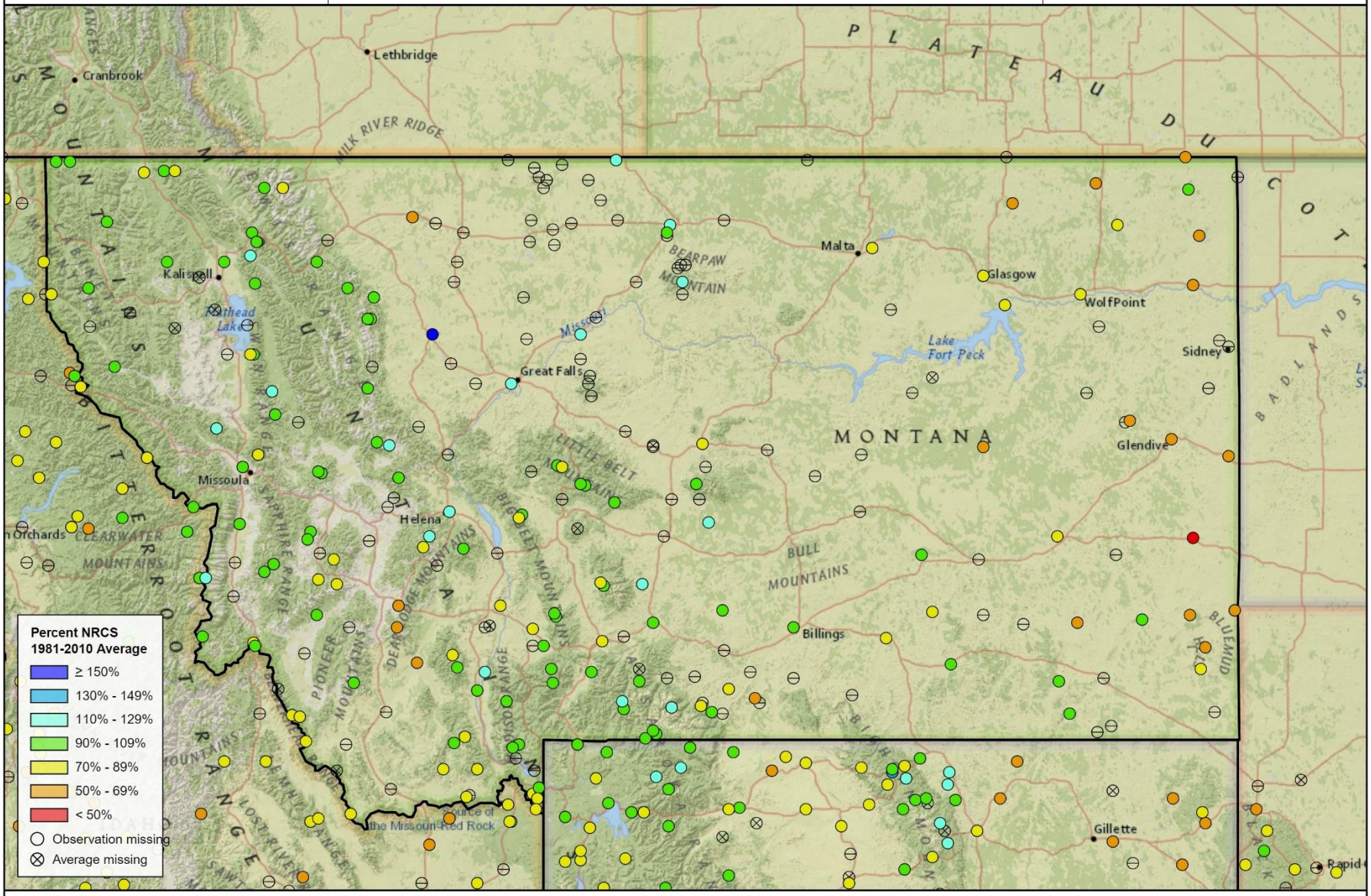
USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

Created 6-07-2021

Water Year to Date Precipitation	Water Year Precipitation - June 1st, 2021 Percent NRCS 1981-2010 Average	October 1, 2020 - May 31, 2021



USDA Natural Resources Conservation Service
United States Department of Agriculture

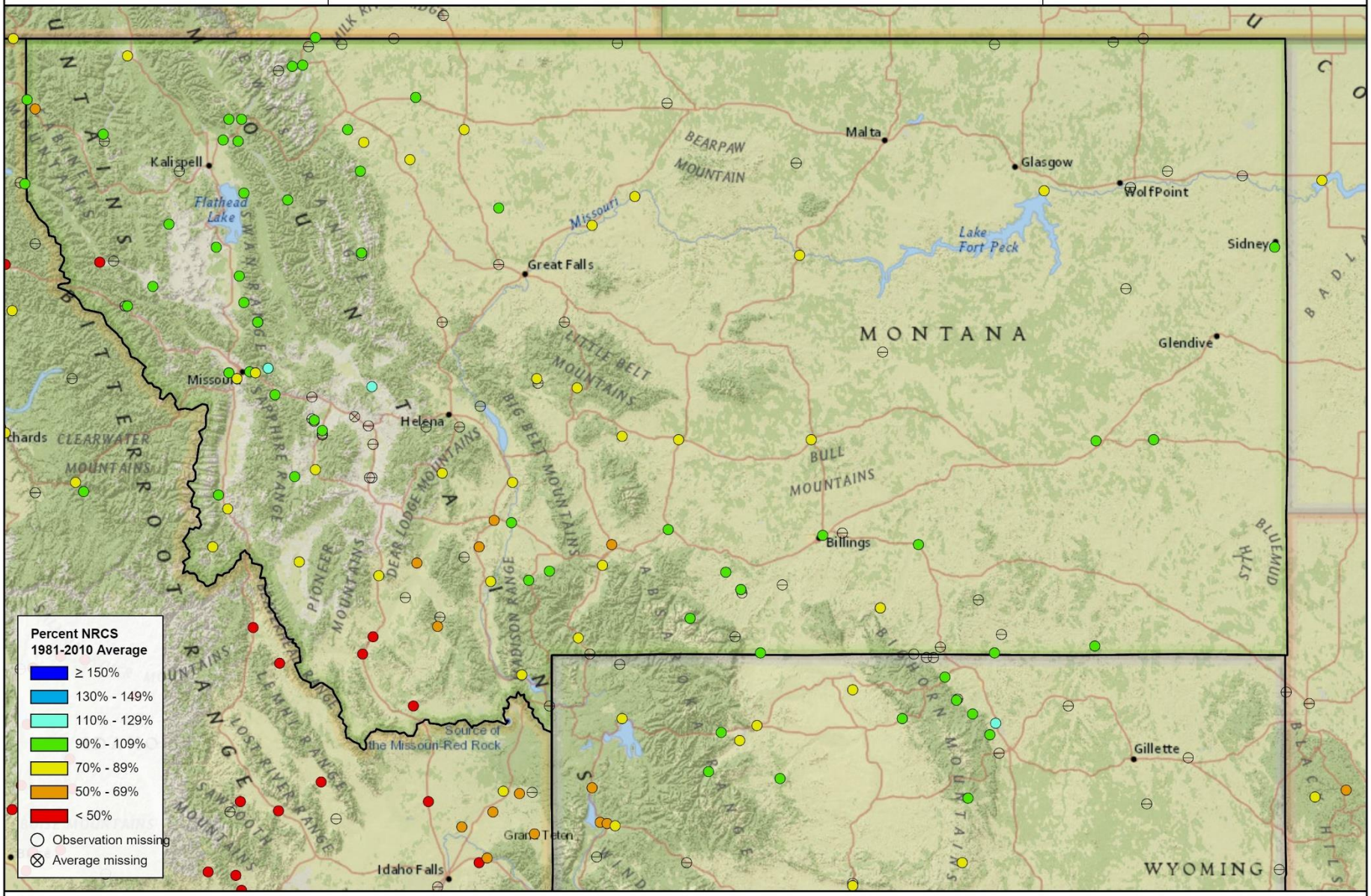
Created 6-07-2021

Forecast Volume,
50% Exceedance Probability

Streamflow Forecasts - June 1st - July 31st, 2021

Percent NRCS 1981-2010 Average

Primary Period, June 1, 2021



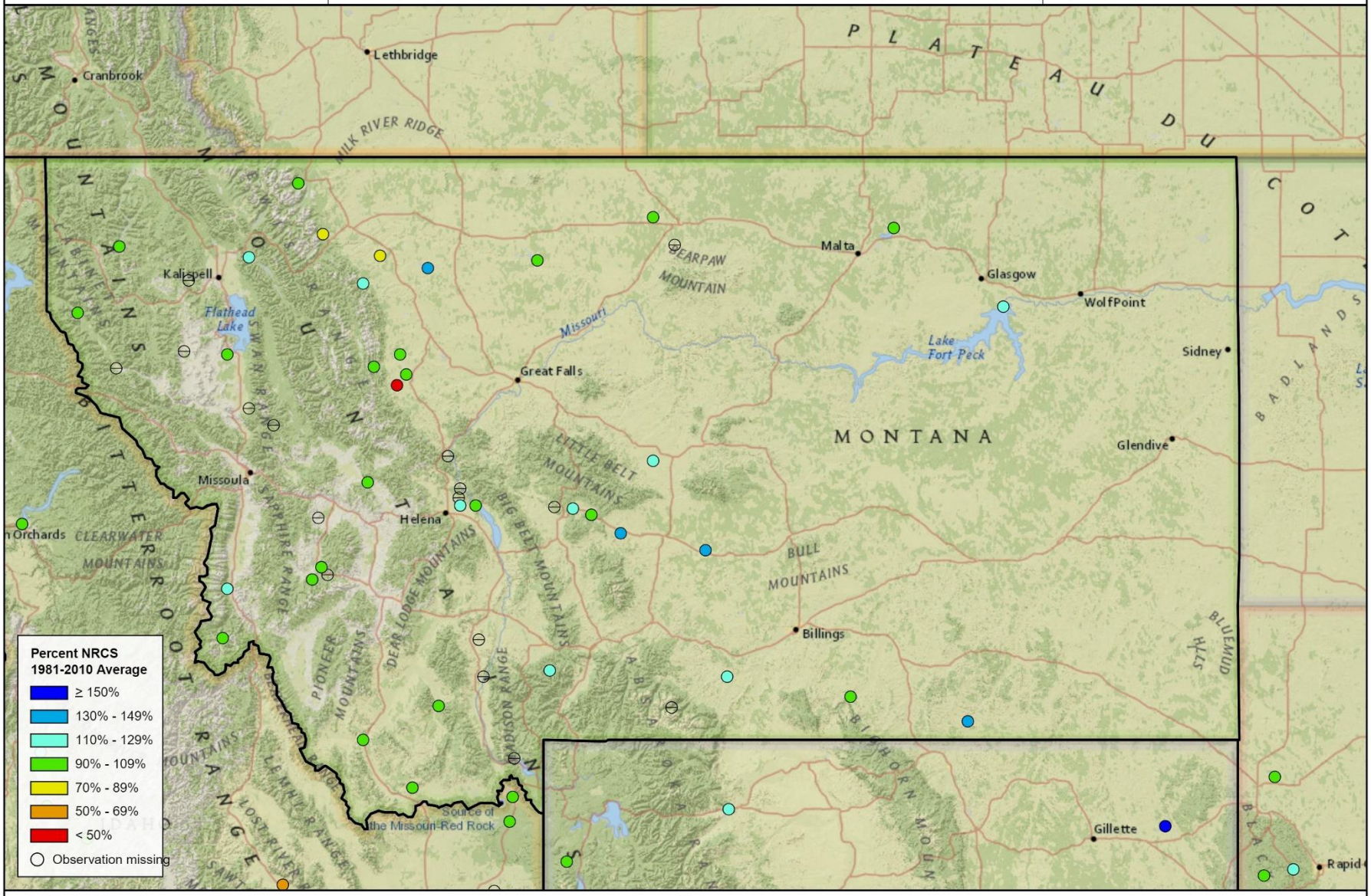
USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

Created 6-07-2021

Reservoir Storage	Reservoir Storage - June 1st, 2021 Percent NRCS 1981-2010 Average	June 1st, 2021



USDA Natural Resources Conservation Service
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N

0 20 40 80 120 160 200 Miles

Created 6-07-2021

WSOR Web Page Access

The links below will take you to web pages dedicated to the individual river basins and statewide overview for presenting the monthly data. Users are encouraged to interact with the maps presented, select different maps using the drop-down menu, and hover over or click on points or basins of interest to view data and plots.

All of the same information that was traditionally included in the legacy monthly river basin summaries is available in these pages. However, if there are sections of the river basin summaries that you miss, please send an email so that we can continue to improve these new webpages and products.

Monthly Data - Interactive Web Pages		
Monthly Data - Statewide Overview		
Monthly Statewide Overview		
Monthly Data - River Basin Summaries		
Columbia River Basin	**Missouri River Basin**	**Yellowstone River Basin**
Kootenai	**Jefferson**	**U. Yellowstone**
Flathead	**Madison**	**Wyoming**
Upper Clark	**Gallatin**	
Bitterroot	**Helena Valley**	
Lower Clark	**Smith-Judith**	
	Sun-Teton	
	St. Mary	
	Milk	

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Montana Water Supply Outlook Report

Natural Resources Conservation Service